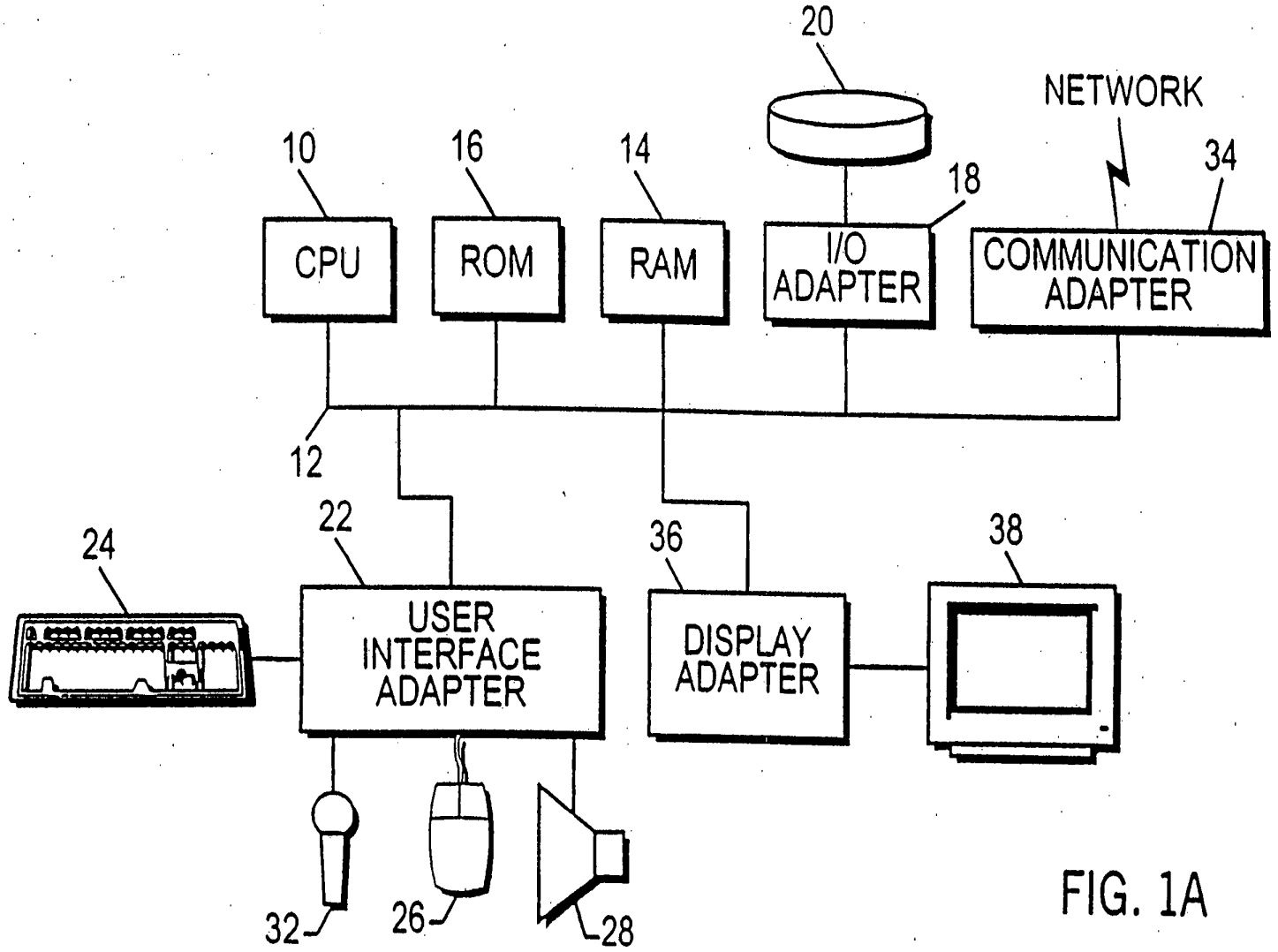

20
NETWORK
10
16
14
18
34
CPU
ROM
RAM
I/O ADAPTER
COMMUNICATION ADAPTER
12
22
24
36
38
USER INTERFACE ADAPTER
DISPLAY ADAPTER
32
26
28

FIG. 1A

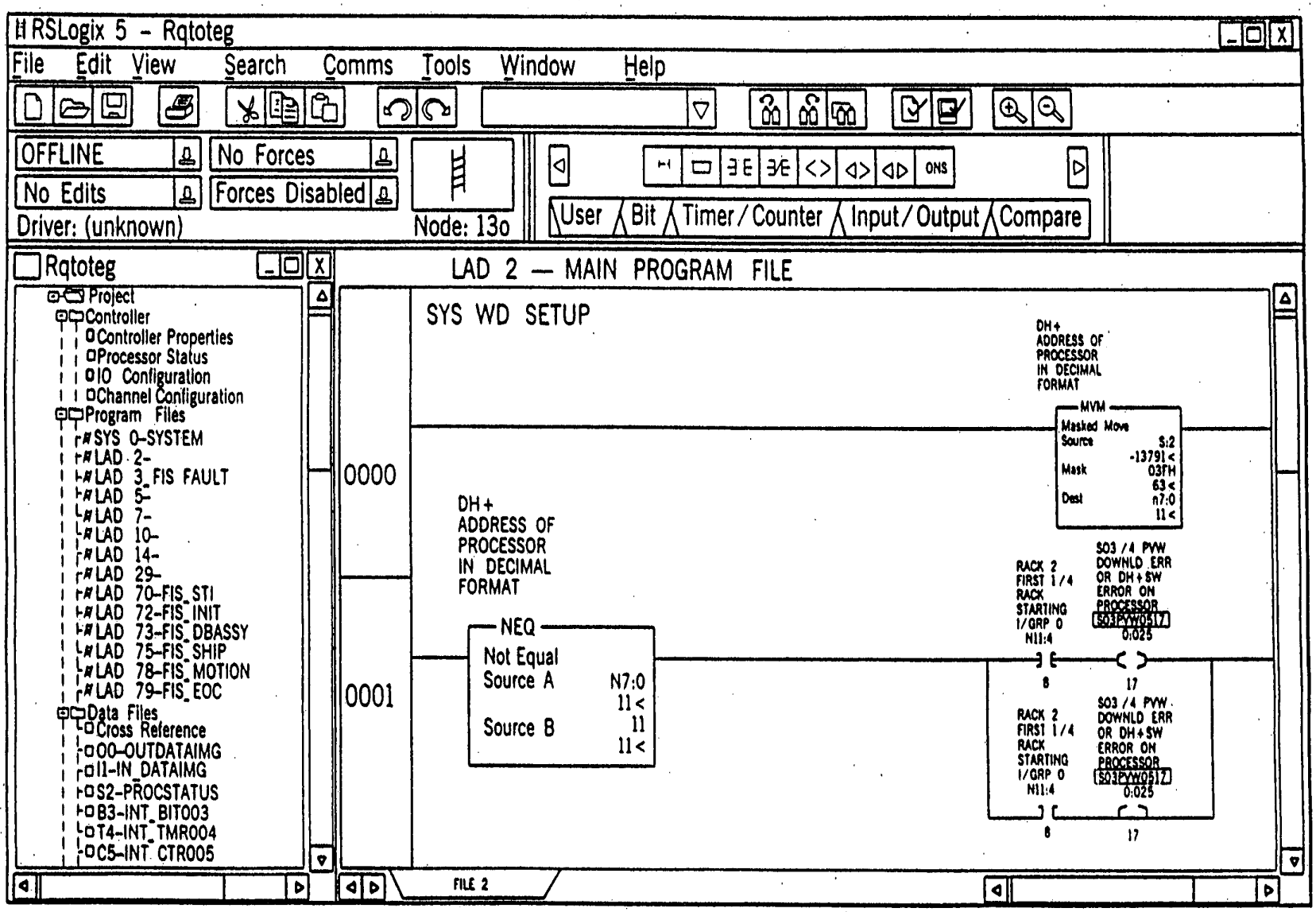

RSLogix 5 - Rqtoteg
File Edit View Search Comms Tools Window Help
OFFLINE
No Forces
No Edits
Forces Disabled
Driver: (unknown)
Node: 13o
User Bit Timer / Counter Input / Output Compare
Rqtoteg
Project
Controller
Controller Properties
Processor Status
IO Configuration
Channel Configuration
Program Files
SYS 0-SYSTEM
LAD 2-
LAD 3_FIS FAULT
LAD 5-
LAD 7-
LAD 10-
LAD 14-
LAD 29-
LAD 70-FIS_STI
LAD 72-FIS_INIT
LAD 73-FIS_DBASSY
LAD 75-FIS_SHIP
LAD 78-FIS_MOTION
LAD 79-FIS_EOC
Data Files
Cross Reference
00-OUTDATAIMG
11-IN_DATAIMG
S2-PROCSTATUS
B3-INT_BIT003
T4-INT_TMR004
C5-INT CTR005
LAD 2 — MAIN PROGRAM FILE
SYS WD SETUP
0000
0001
DH+ ADDRESS OF PROCESSOR IN DECIMAL FORMAT
MVM
Masked Move
Source S:2 -13791<
Mask 03FH 63<
Dest n7:0 11<
DH+ ADDRESS OF PROCESSOR IN DECIMAL FORMAT
NEQ
Not Equal
Source A N7:0 11<
Source B 11 11<
RACK 2 FIRST 1/4 RACK STARTING I/GRP 0 N11:4
S03/4 PVW DOWNLD ERR OR DH+SW ERROR ON PROCESSOR
S03PVW0517
0:025
8
17
RACK 2 FIRST 1/4 RACK STARTING I/GRP 0 N11:4
S03/4 PVW DOWNLD ERR OR DH+SW ERROR ON PROCESSOR
S03PVW0517
0:025
8
17
FILE 2

FIG. 1B

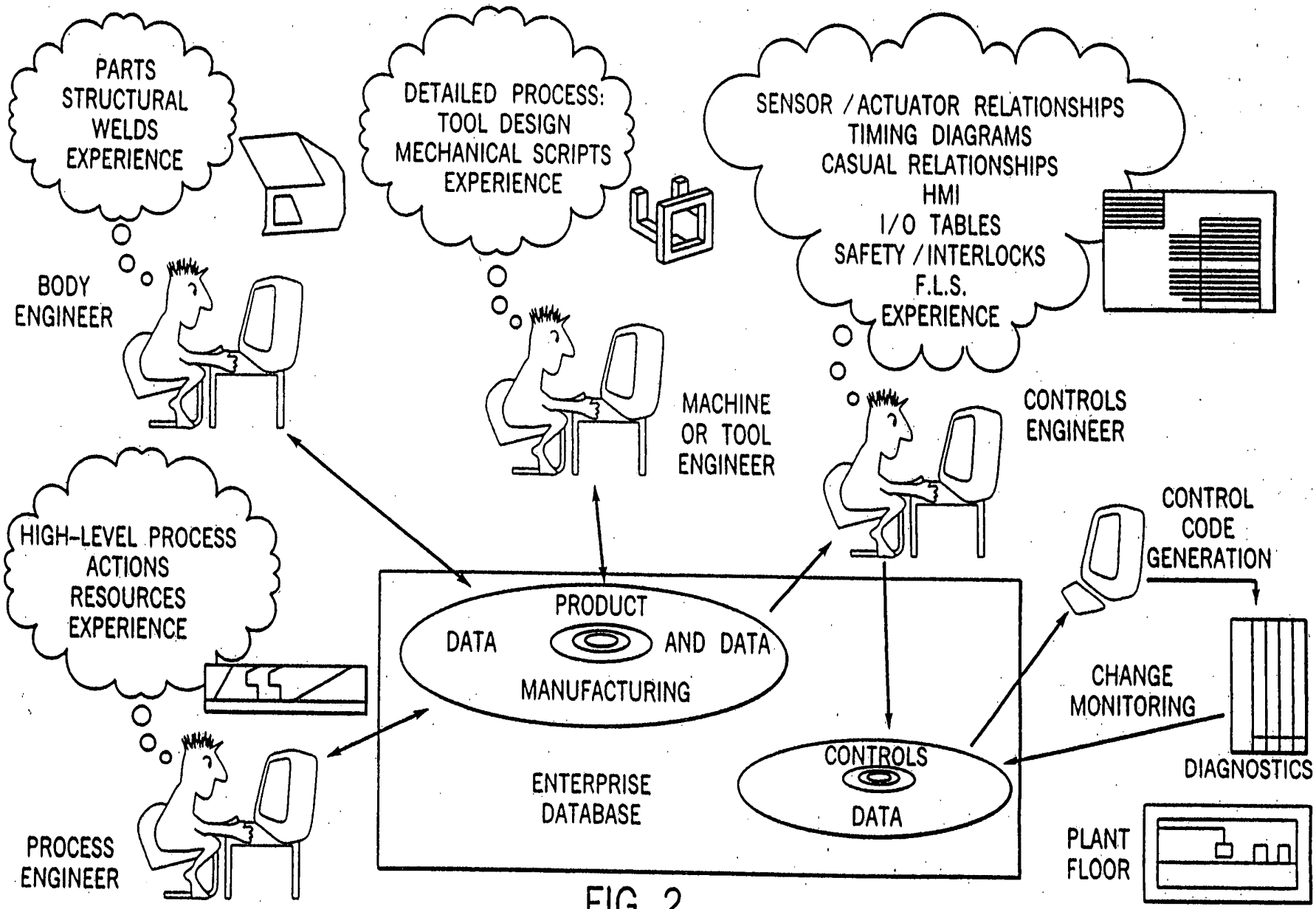

PARTS
STRUCTURAL
WELDS
EXPERIENCE
DETAILED PROCESS:
TOOL DESIGN
MECHANICAL SCRIPTS
EXPERIENCE
SENSOR / ACTUATOR RELATIONSHIPS
TIMING DIAGRAMS
CASUAL RELATIONSHIPS
HMI
I/O TABLES
SAFETY / INTERLOCKS
F.L.S.
EXPERIENCE
BODY
ENGINEER
MACHINE
OR TOOL
ENGINEER
CONTROLS
ENGINEER
HIGH-LEVEL PROCESS
ACTIONS
RESOURCES
EXPERIENCE
CONTROL
CODE
GENERATION
PRODUCT
DATA
AND DATA
MANUFACTURING
CHANGE
MONITORING
DIAGNOSTICS
CONTROLS
DATA
ENTERPRISE
DATABASE
PROCESS
ENGINEER
PLANT
FLOOR

FIG. 2

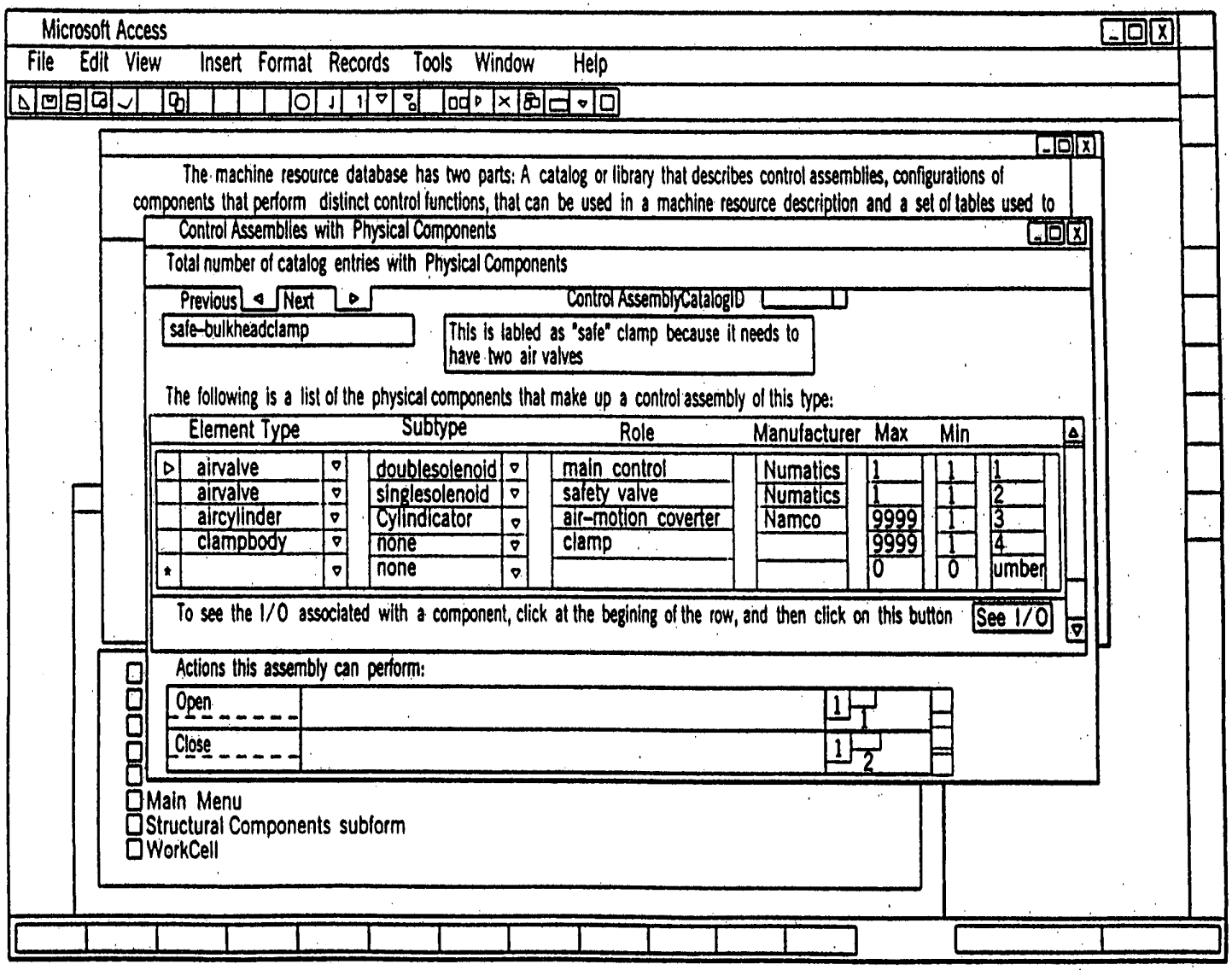

Microsoft Access
File Edit View Insert Format Records Tools Window Help
The machine resource database has two parts: A catalog or library that describes control assemblies, configurations of components that perform distinct control functions, that can be used in a machine resource description and a set of tables used to
Control Assemblies with Physical Components
Total number of catalog entries with Physical Components
Previous
Next
Control AssemblyCatalogID
safe-bulkheadclamp
This is labled as "safe" clamp because it needs to have two air valves
The following is a list of the physical components that make up a control assembly of this type:
Element Type
Subtype
Role
Manufacturer
Max
Min
airvalve
doublesolenoid
main control
Numatics
1
1
1
airvalve
singlesolenoid
safety valve
Numatics
1
1
2
aircylinder
Cylindicator
air-motion coverter
Namco
9999
1
3
clampbody
none
clamp
9999
1
4
none
0
0
umber
To see the I/O associated with a component, click at the begining of the row, and then click on this button
See I/O
Actions this assembly can perform:
Open
Close
Main Menu
Structural Components subform
WorkCell

FIG. 3

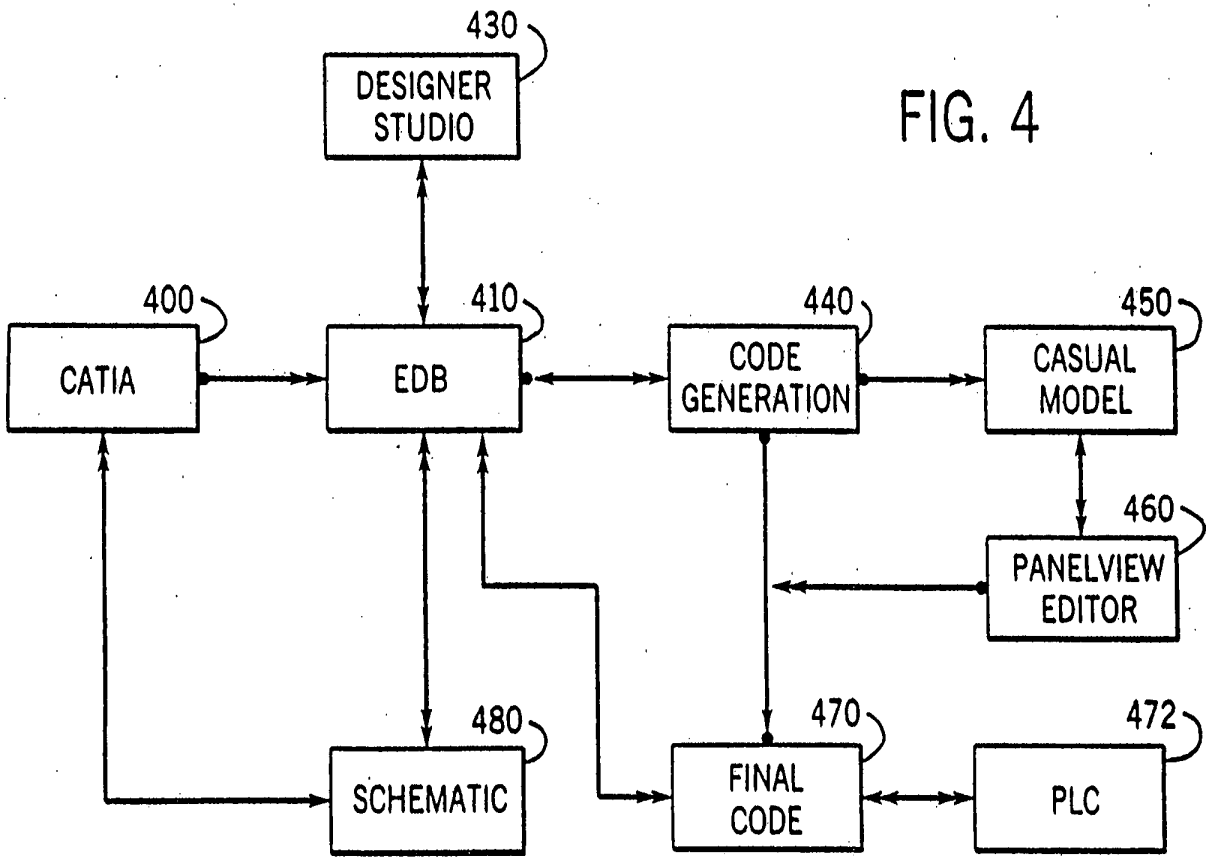

430
DESIGNER STUDIO
400
CATIA
410
EDB
440
CODE GENERATION
450
CASUAL MODEL
460
PANELVIEW EDITOR
480
SCHEMATIC
470
FINAL CODE
472
PLC

FIG. 4

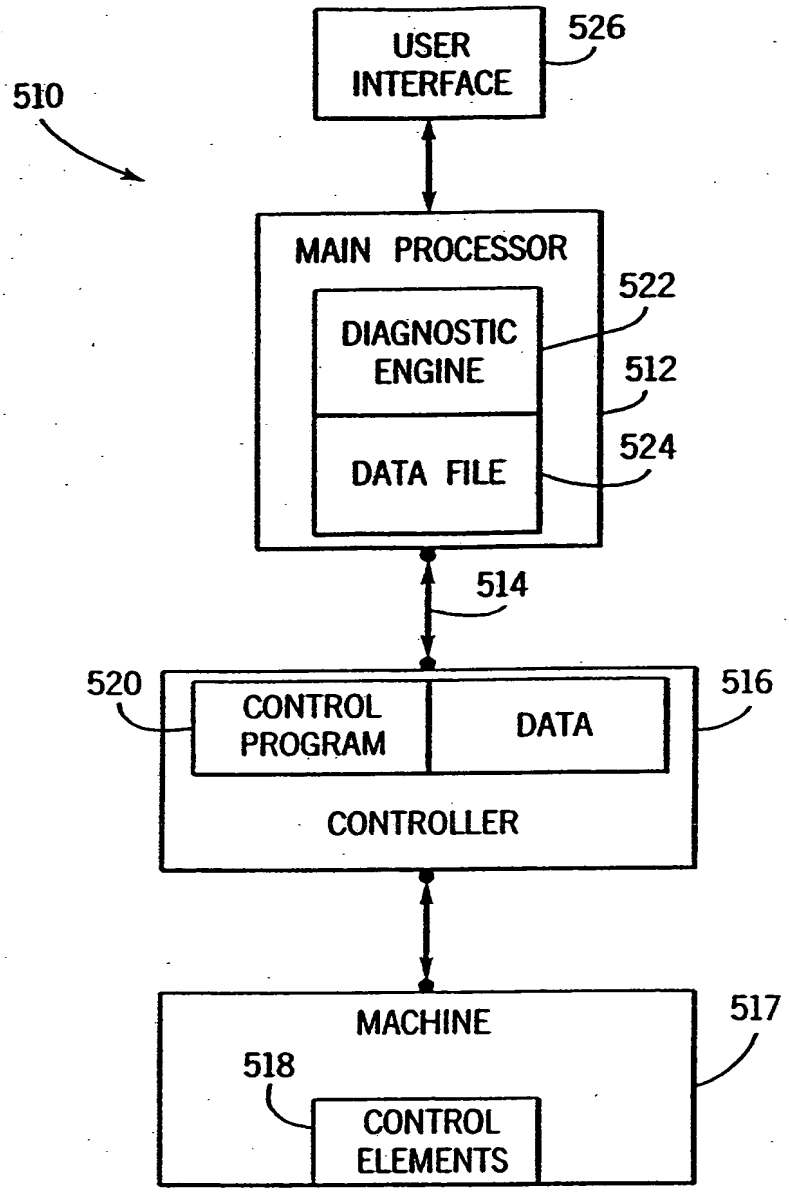
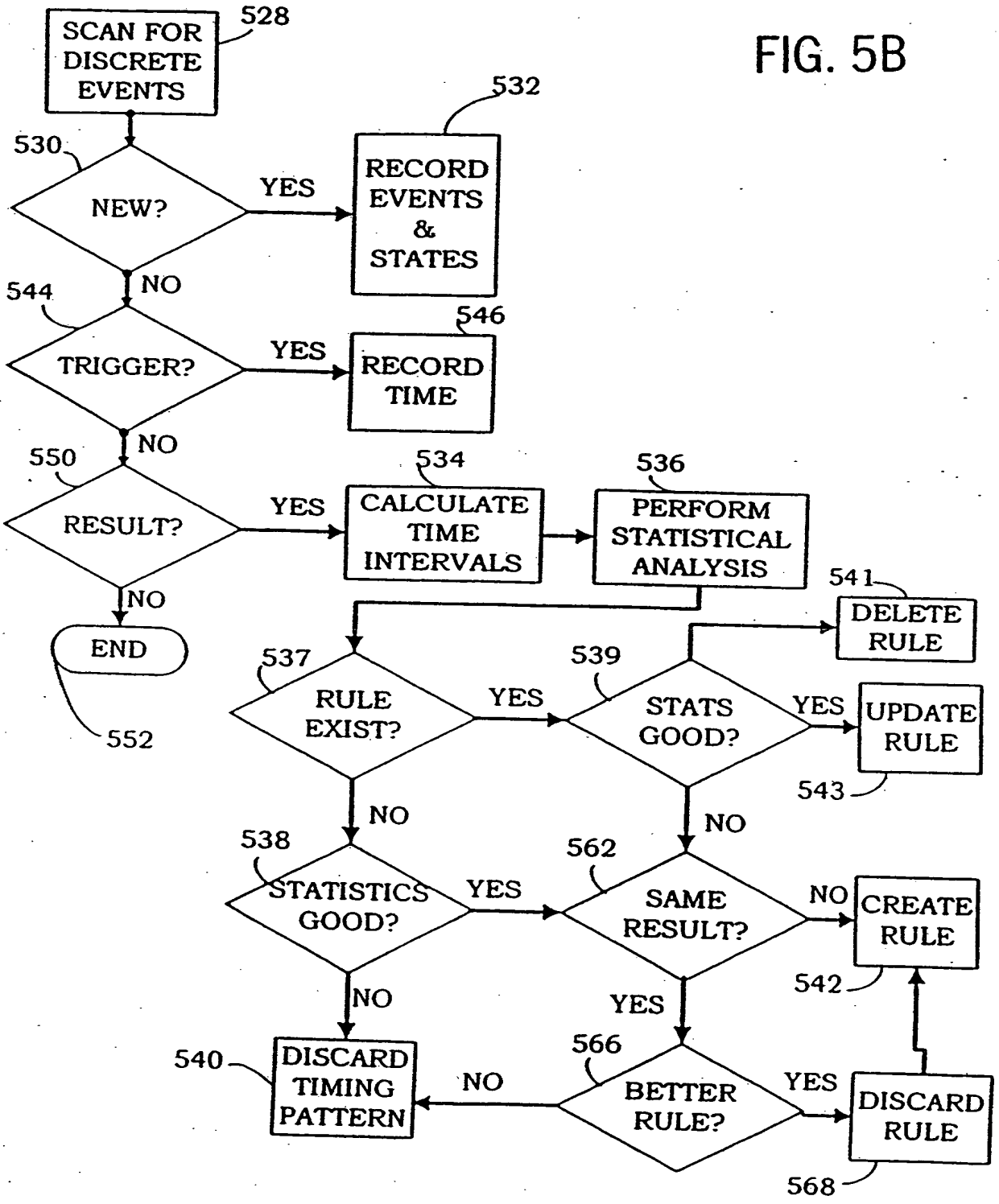

510
USER INTERFACE
526
MAIN PROCESSOR
DIAGNOSTIC ENGINE
522
512
DATA FILE
524
514
520
CONTROL PROGRAM
DATA
516
CONTROLLER
MACHINE
517
518
CONTROL ELEMENTS

FIG. 5A

FIG. 5B


SCAN FOR DISCRETE EVENTS
528
NEW?
530
YES
RECORD EVENTS & STATES
532
NO
TRIGGER?
544
YES
RECORD TIME
546
NO
RESULT?
550
YES
CALCULATE TIME INTERVALS
534
PERFORM STATISTICAL ANALYSIS
536
NO
END
552
DELETE RULE
541
RULE EXIST?
537
YES
STATS GOOD?
539
YES
UPDATE RULE
543
NO
NO
STATISTICS GOOD?
538
YES
SAME RESULT?
562
NO
CREATE RULE
542
NO
YES
DISCARD TIMING PATTERN
540
NO
BETTER RULE?
566
YES
DISCARD RULE
568

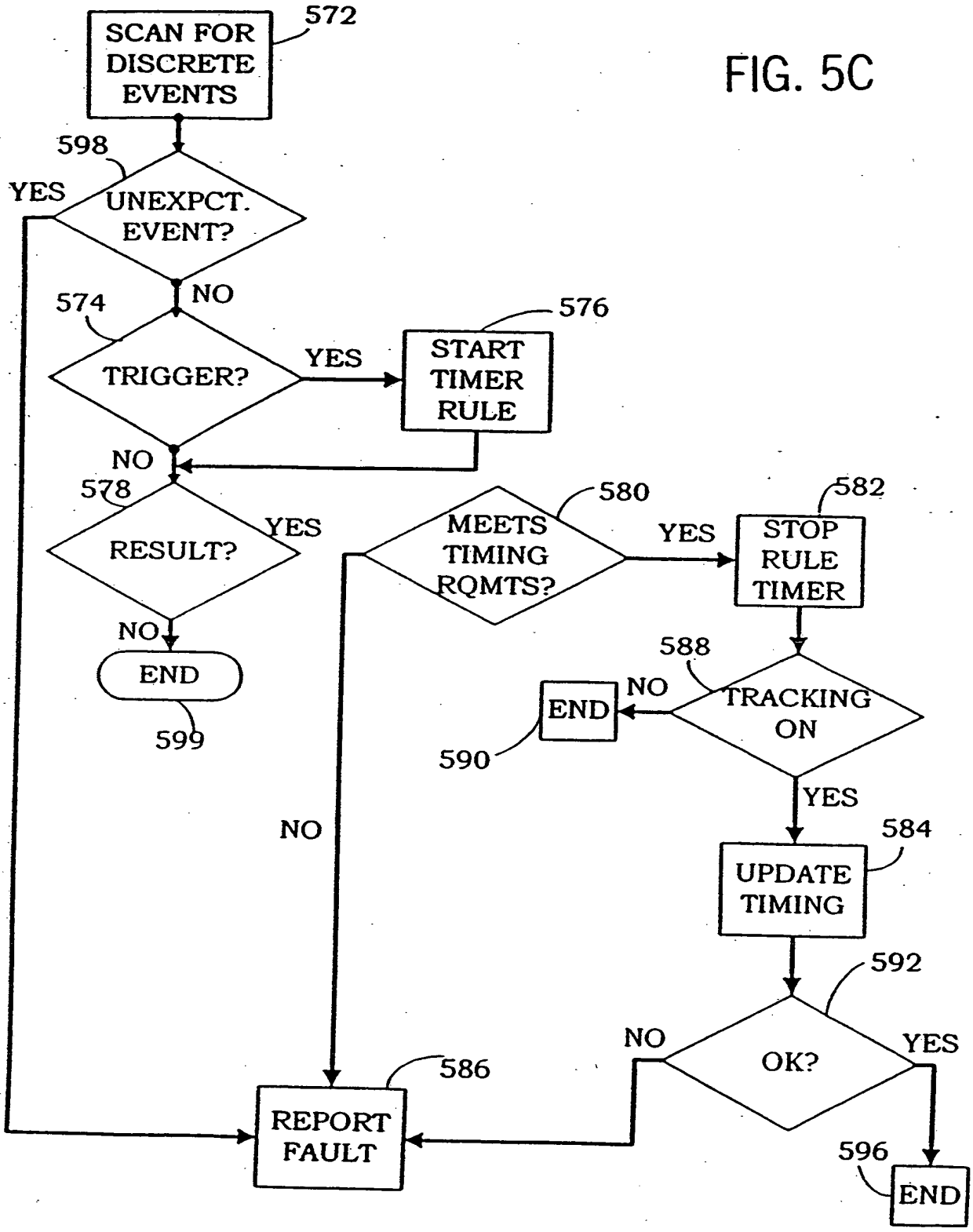

SCAN FOR DISCRETE EVENTS
572
598
UNEXPCT. EVENT?
YES
NO
574
TRIGGER?
YES
576
START TIMER RULE
NO
578
RESULT?
YES
NO
END
599
MEETS TIMING RQMTS?
580
YES
582
STOP RULE TIMER
588
TRACKING ON
NO
END
590
YES
584
UPDATE TIMING
592
OK?
NO
YES
586
REPORT FAULT
596
END

FIG. 5C

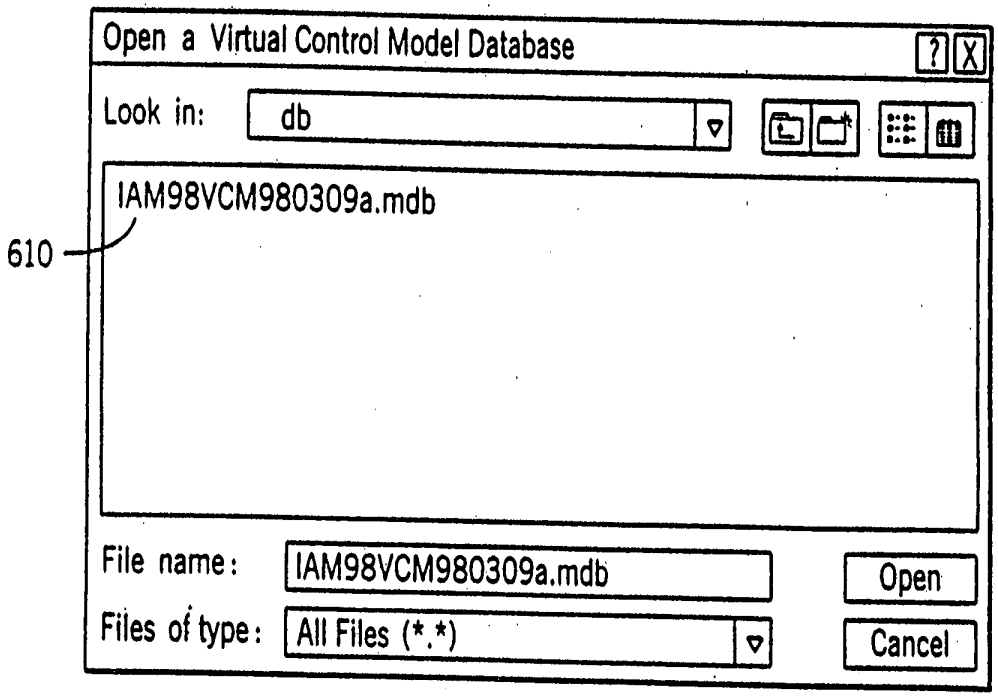

Open a Virtual Control Model Database
Look in:
db
IAM98VCM980309a.mdb
610
File name:
IAM98VCM980309a.mdb
Open
Files of type:
All Files (*.*)
Cancel

FIG. 6

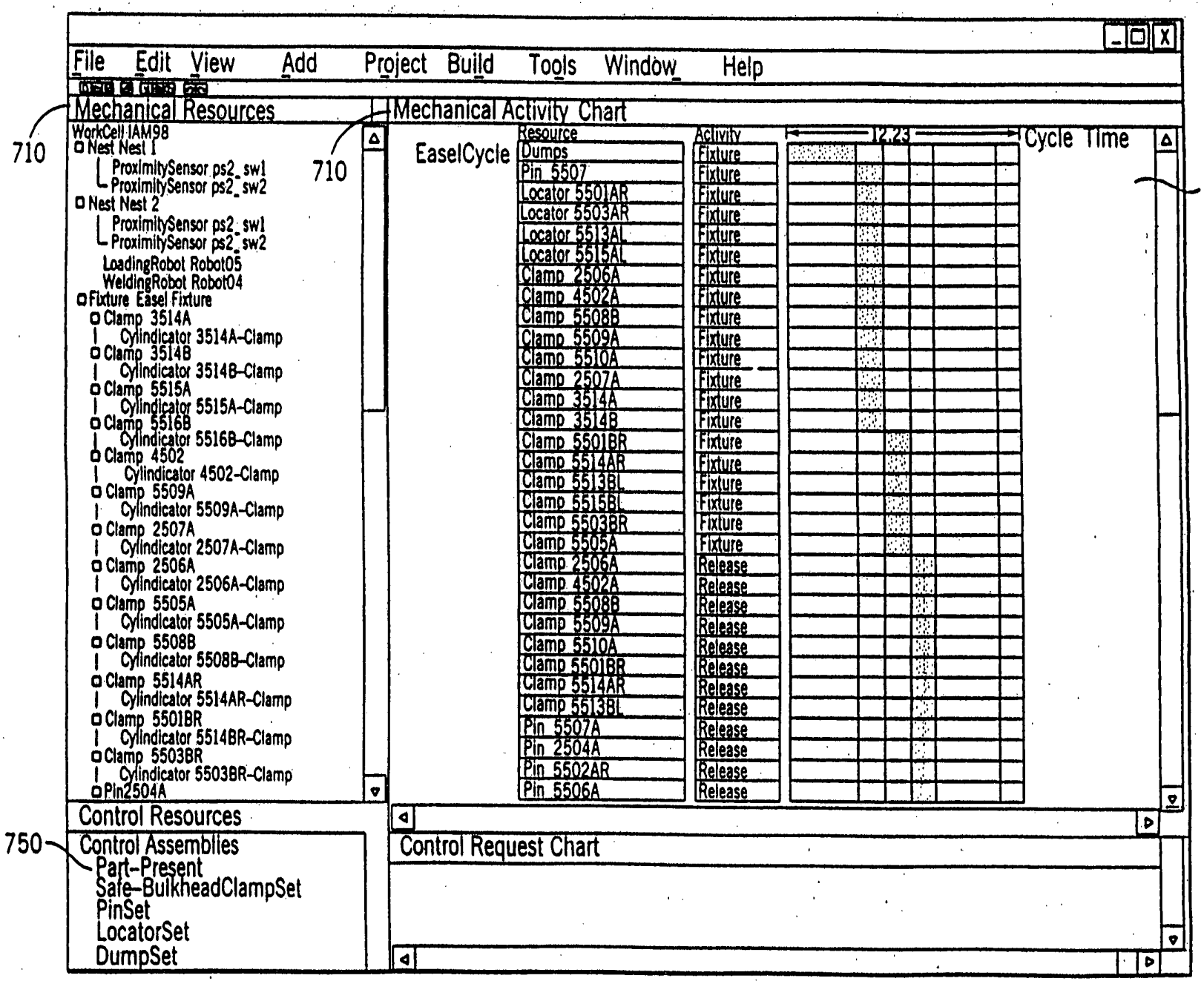

File Edit View Add Project Build Tools Window Help
Mechanical Resources
710
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
Cylindicator 5515A-Clamp
Clamp 5516B
Cylindicator 5516B-Clamp
Clamp 4502
Cylindicator 4502-Clamp
Clamp 5509A
Cylindicator 5509A-Clamp
Clamp 2507A
Cylindicator 2507A-Clamp
Clamp 2506A
Cylindicator 2506A-Clamp
Clamp 5505A
Cylindicator 5505A-Clamp
Clamp 5508B
Cylindicator 5508B-Clamp
Clamp 5514AR
Cylindicator 5514AR-Clamp
Clamp 5501BR
Cylindicator 5514BR-Clamp
Clamp 5503BR
Cylindicator 5503BR-Clamp
Pin2504A
Control Resources
750
Control Assemblies
Part-Present
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Mechanical Activity Chart
710
EaselCycle
Resource
Activity
12.23
Cycle Time
720
Dumps Fixture
Pin 5507 Fixture
Locator 5501AR Fixture
Locator 5503AR Fixture
Locator 5513AL Fixture
Locator 5515AL Fixture
Clamp 2506A Fixture
Clamp 4502A Fixture
Clamp 5508B Fixture
Clamp 5509A Fixture
Clamp 5510A Fixture
Clamp 2507A Fixture
Clamp 3514A Fixture
Clamp 3514B Fixture
Clamp 5501BR Fixture
Clamp 5514AR Fixture
Clamp 5513BL Fixture
Clamp 5515BL Fixture
Clamp 5503BR Fixture
Clamp 5505A Fixture
Clamp 2506A Release
Clamp 4502A Release
Clamp 5508B Release
Clamp 5509A Release
Clamp 5510A Release
Clamp 5501BR Release
Clamp 5514AR Release
Clamp 5513BL Release
Pin 5507A Release
Pin 2504A Release
Pin 5502AR Release
Pin 5506A Release
Control Request Chart

FIG. 7

FIG. 8

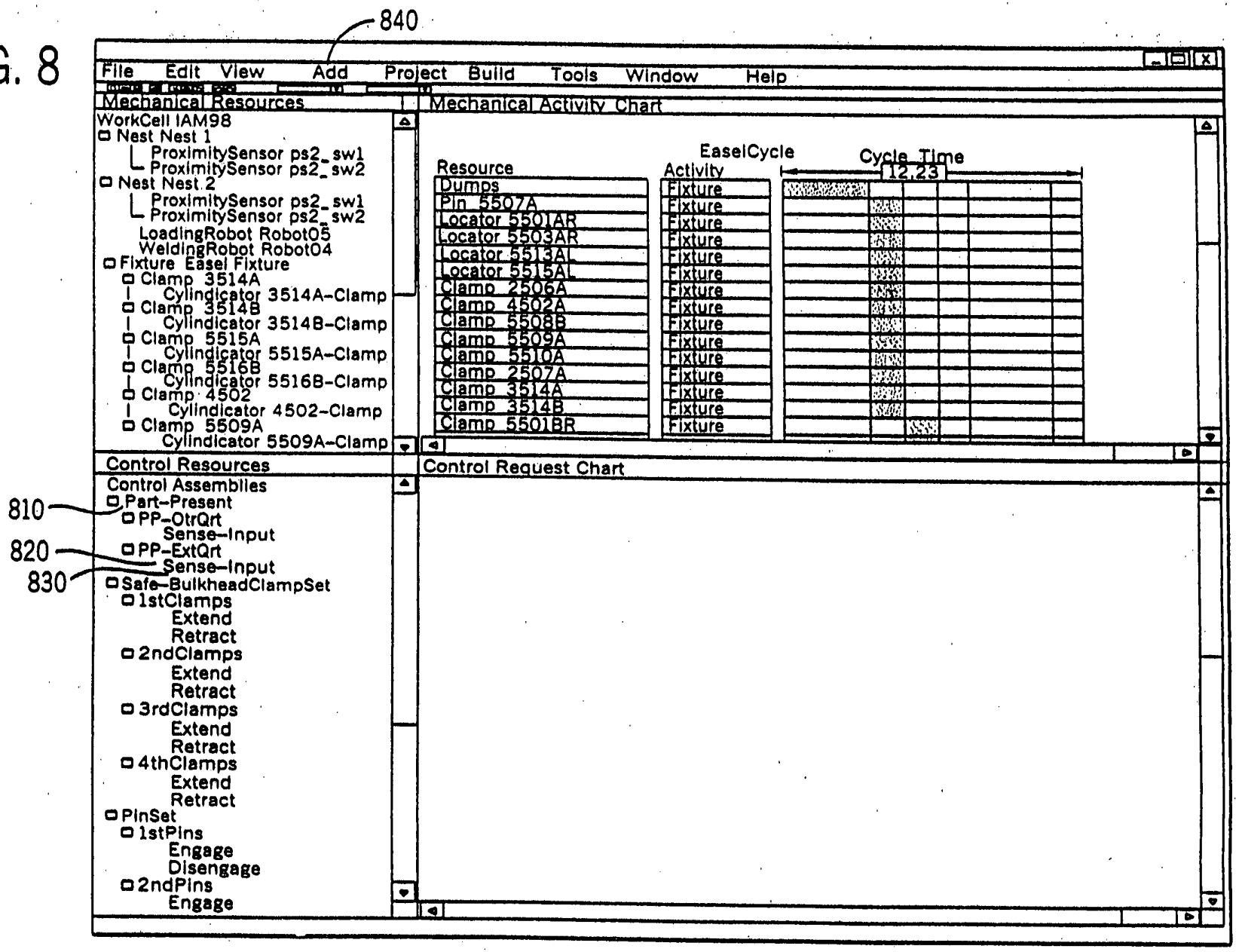

840
File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
Cylindicator 5515A-Clamp
Clamp 5516B
Cylindicator 5516B-Clamp
Clamp 4502
Cylindicator 4502-Clamp
Clamp 5509A
Cylindicator 5509A-Clamp
Mechanical Activity Chart
EaselCycle
Cycle Time
12.23
Resource
Activity
Dumps Fixture
Pin 5507A Fixture
Locator 5501AR Fixture
Locator 5503AR Fixture
Locator 5513AL Fixture
Locator 5515AL Fixture
Clamp 2506A Fixture
Clamp 4502A Fixture
Clamp 5508B Fixture
Clamp 5509A Fixture
Clamp 5510A Fixture
Clamp 2507A Fixture
Clamp 3514A Fixture
Clamp 3514B Fixture
Clamp 5501BR Fixture
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
Sense-Input
PP-ExtQrt
Sense-Input
Safe-BulkheadClampSet
1stClamps
Extend
Retract
2ndClamps
Extend
Retract
3rdClamps
Extend
Retract
4thClamps
Extend
Retract
PinSet
1stPins
Engage
Disengage
2ndPins
Engage
Control Request Chart
810
820
830

FIG. 9

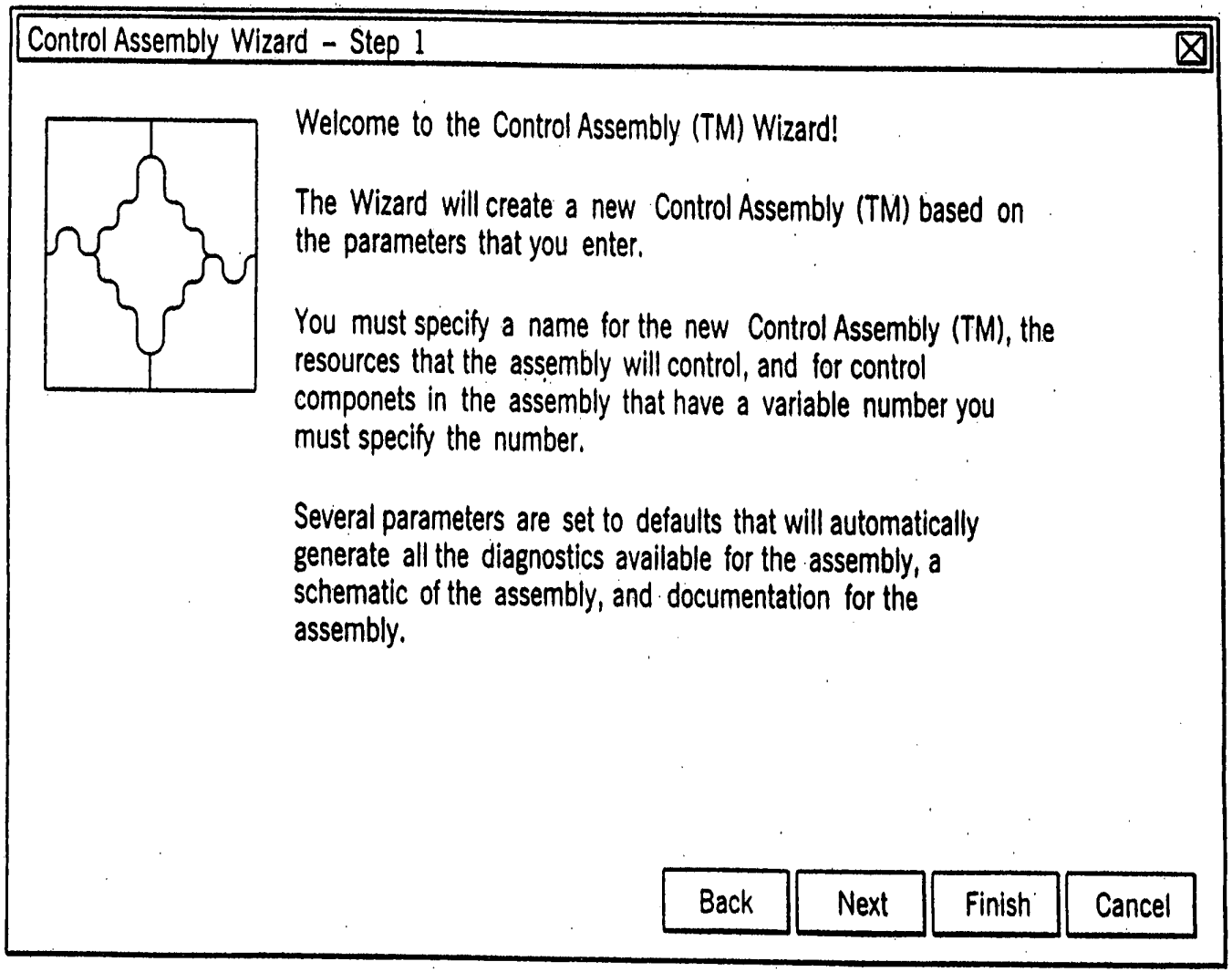

Control Assembly Wizard - Step 1
Welcome to the Control Assembly (TM) Wizard!
The Wizard will create a new Control Assembly (TM) based on the parameters that you enter.
You must specify a name for the new Control Assembly (TM), the resources that the assembly will control, and for control componets in the assembly that have a variable number you must specify the number.
Several parameters are set to defaults that will automatically generate all the diagnostics available for the assembly, a schematic of the assembly, and documentation for the assembly.
Back
Next
Finish
Cancel

FIG. 10

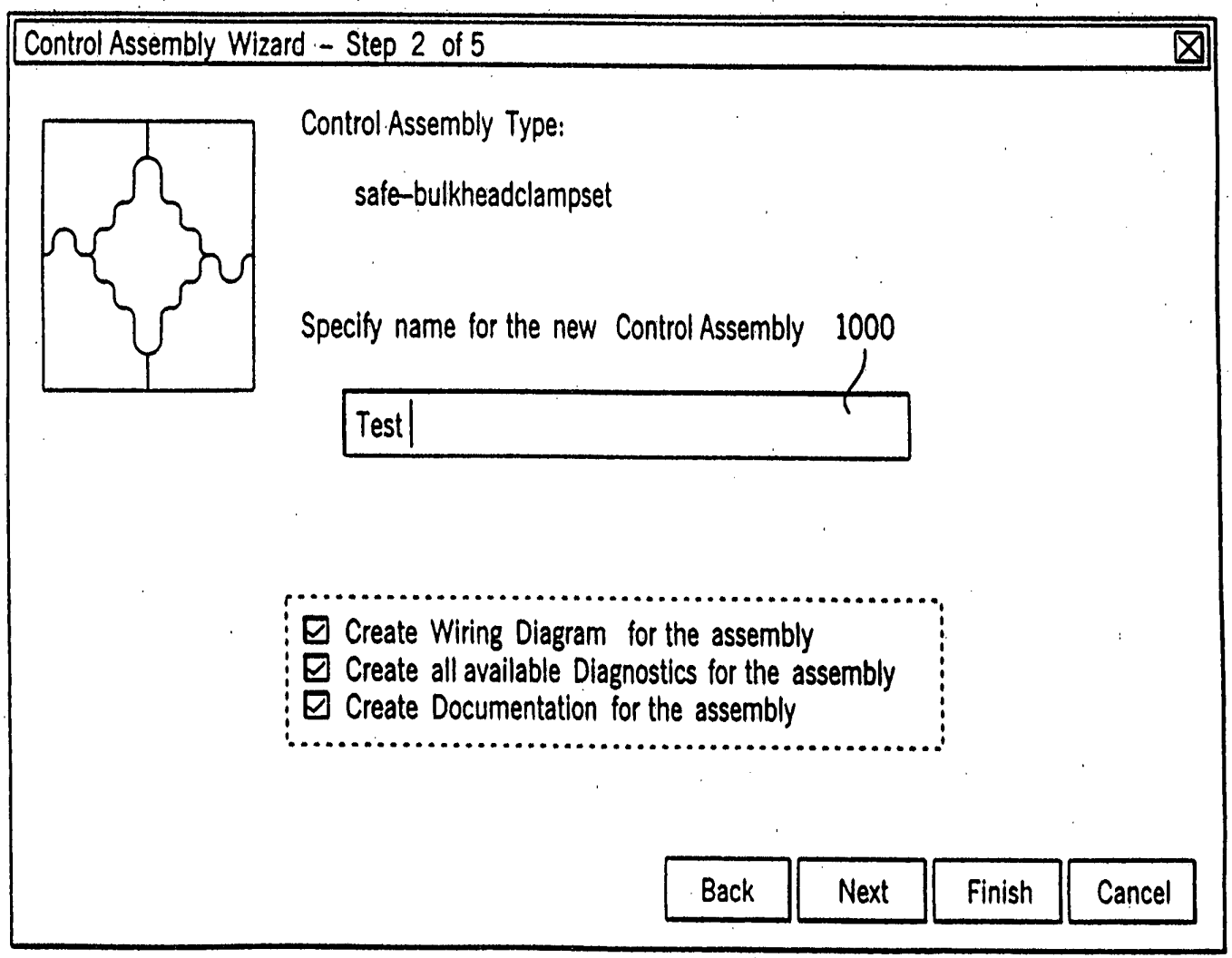

Control Assembly Wizard – Step 2 of 5
Control Assembly Type:
safe-bulkheadclampset
Specify name for the new Control Assembly
1000
Test
Create Wiring Diagram for the assembly
Create all available Diagnostics for the assembly
Create Documentation for the assembly
Back
Next
Finish
Cancel

FIG. 11

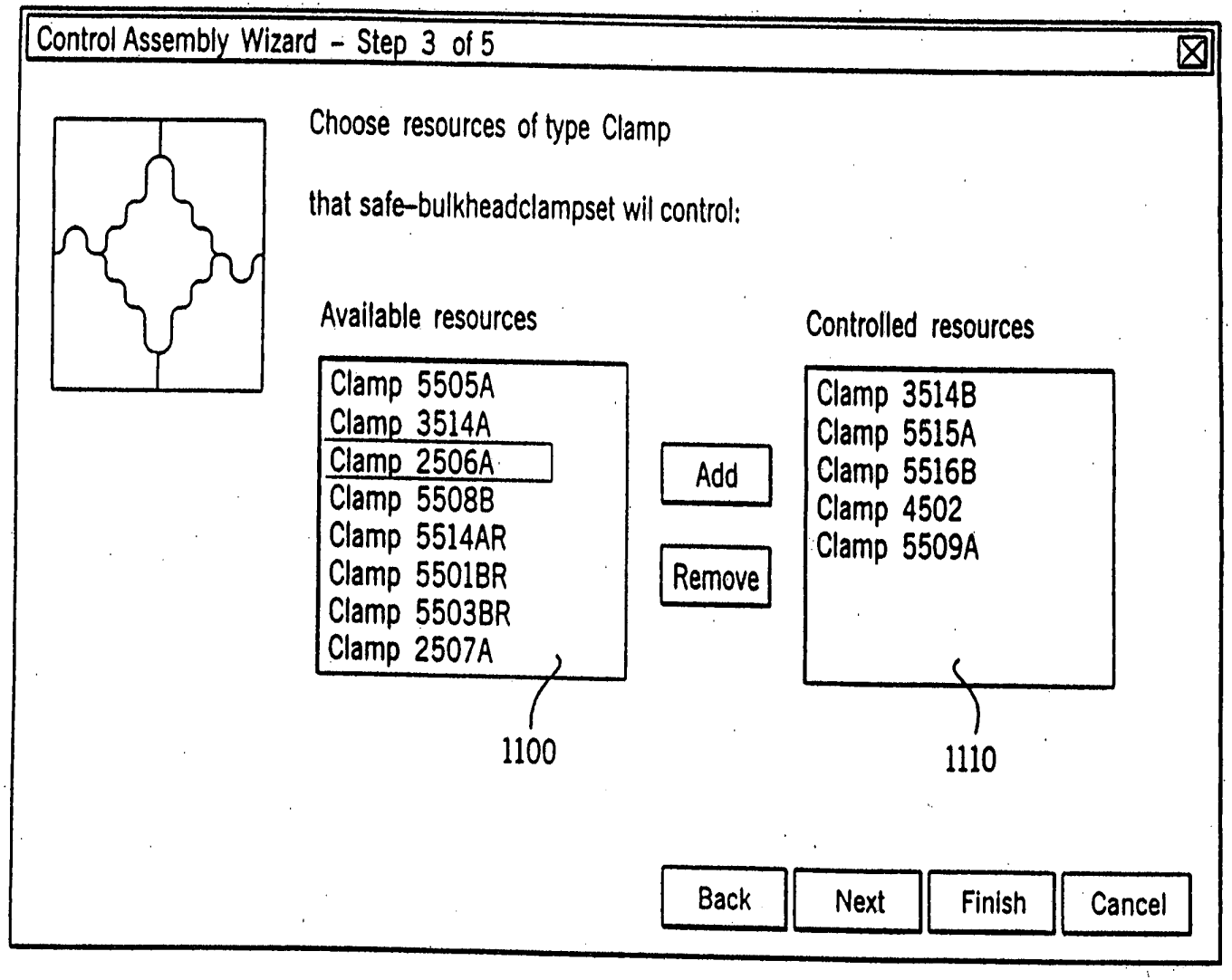
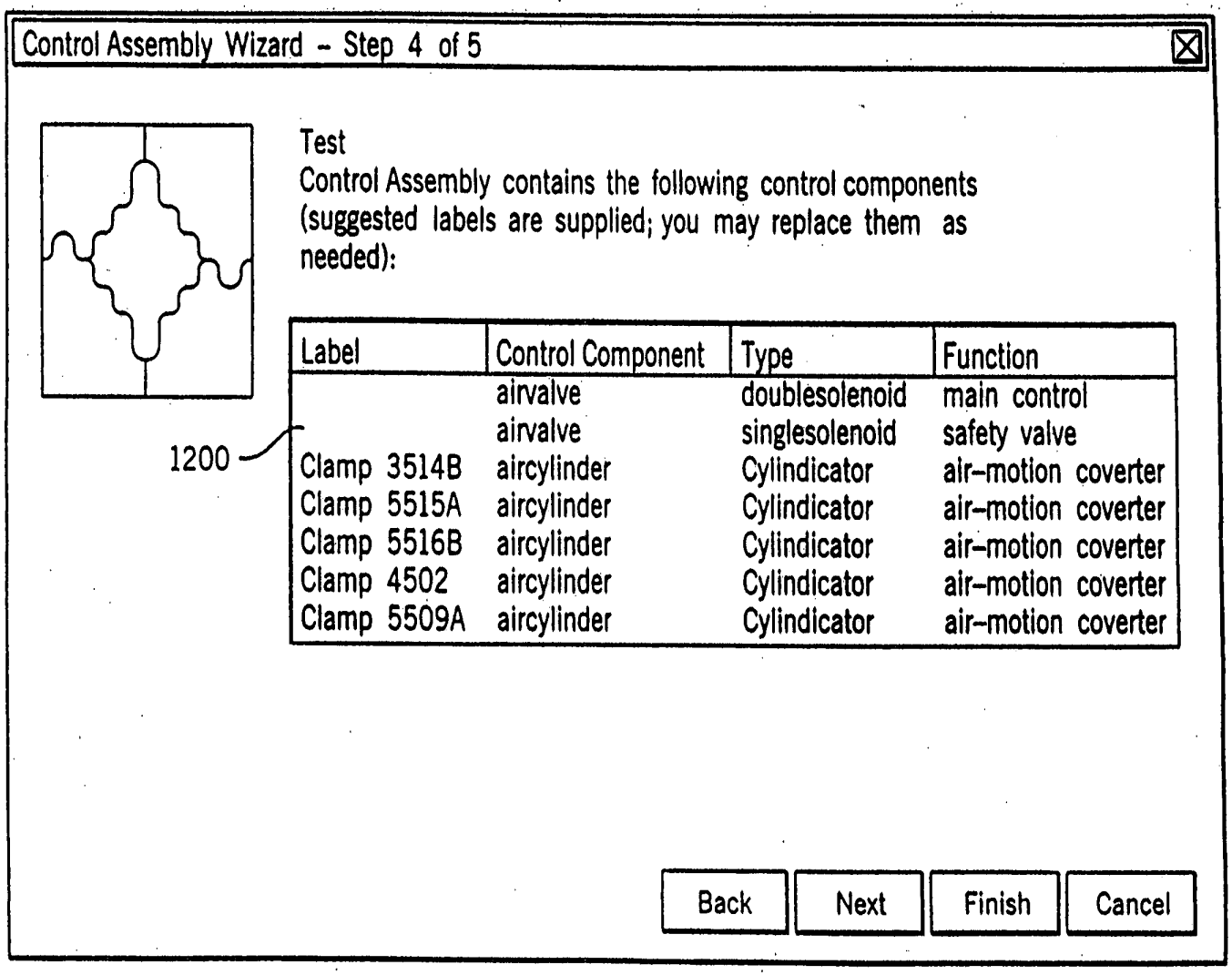

Control Assembly Wizard – Step 3 of 5
Choose resources of type Clamp
that safe-bulkheadclampset wil control:
Available resources
Clamp 5505A
Clamp 3514A
Clamp 2506A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Clamp 2507A
1100
Add
Remove
Controlled resources
Clamp 3514B
Clamp 5515A
Clamp 5516B
Clamp 4502
Clamp 5509A
1110
Back
Next
Finish
Cancel

FIG. 12


Control Assembly Wizard - Step 4 of 5
Test
Control Assembly contains the following control components (suggested labels are supplied; you may replace them as needed):
1200
Label | Control Component | Type | Function
airvalve | doublesolenoid | main control
airvalve | singlesolenoid | safety valve
Clamp 3514B | aircylinder | Cylindicator | air-motion coverter
Clamp 5515A | aircylinder | Cylindicator | air-motion coverter
Clamp 5516B | aircylinder | Cylindicator | air-motion coverter
Clamp 4502 | aircylinder | Cylindicator | air-motion coverter
Clamp 5509A | aircylinder | Cylindicator | air-motion coverter
Back
Next
Finish
Cancel

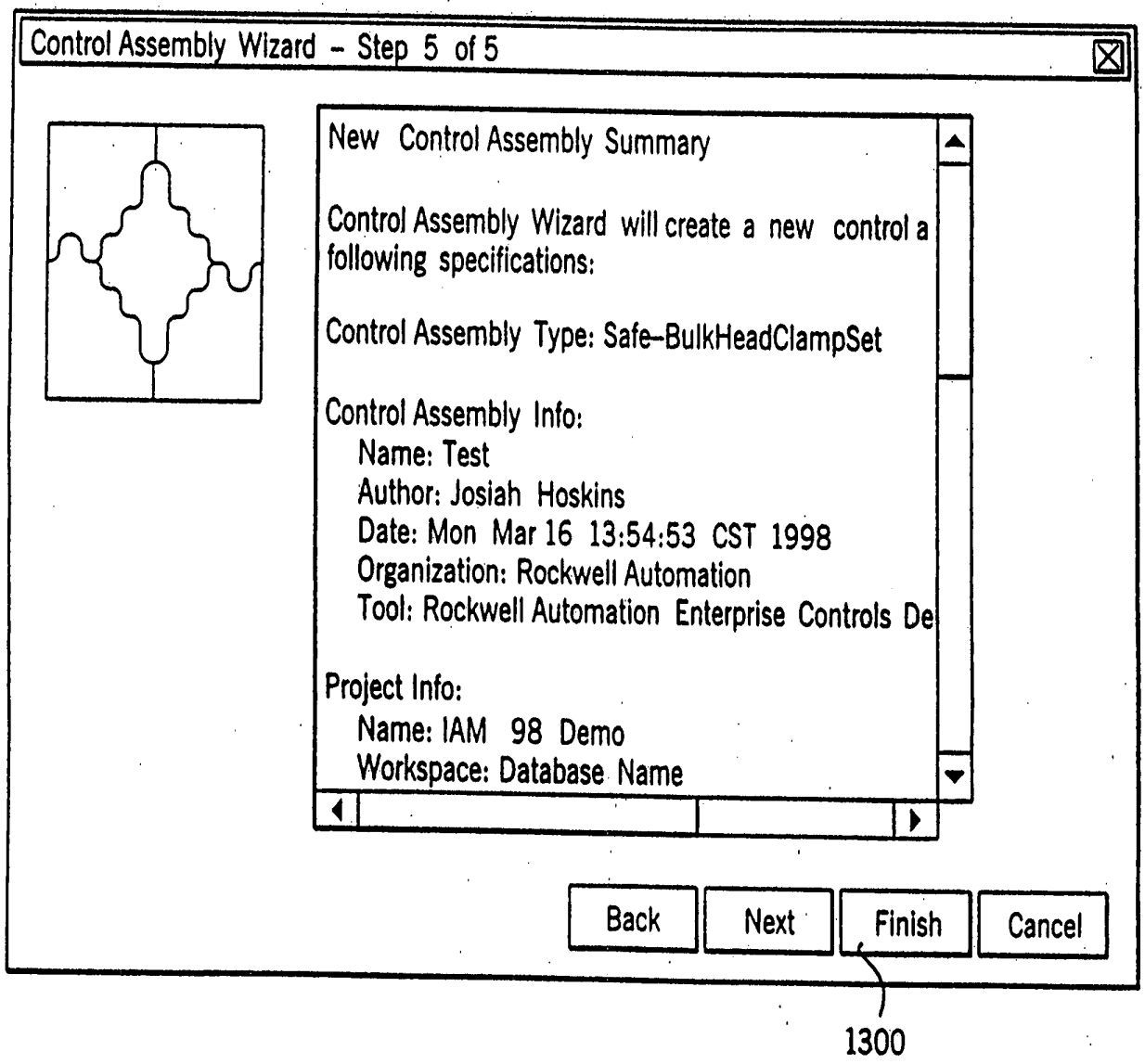

Control Assembly Wizard – Step 5 of 5
New Control Assembly Summary
Control Assembly Wizard will create a new control a
following specifications:
Control Assembly Type: Safe–BulkHeadClampSet
Control Assembly Info:
Name: Test
Author: Josiah Hoskins
Date: Mon Mar 16 13:54:53 CST 1998
Organization: Rockwell Automation
Tool: Rockwell Automation Enterprise Controls De
Project Info:
Name: IAM 98 Demo
Workspace: Database Name
Back
Next
Finish
Cancel
1300

FIG. 13

FIG. 14

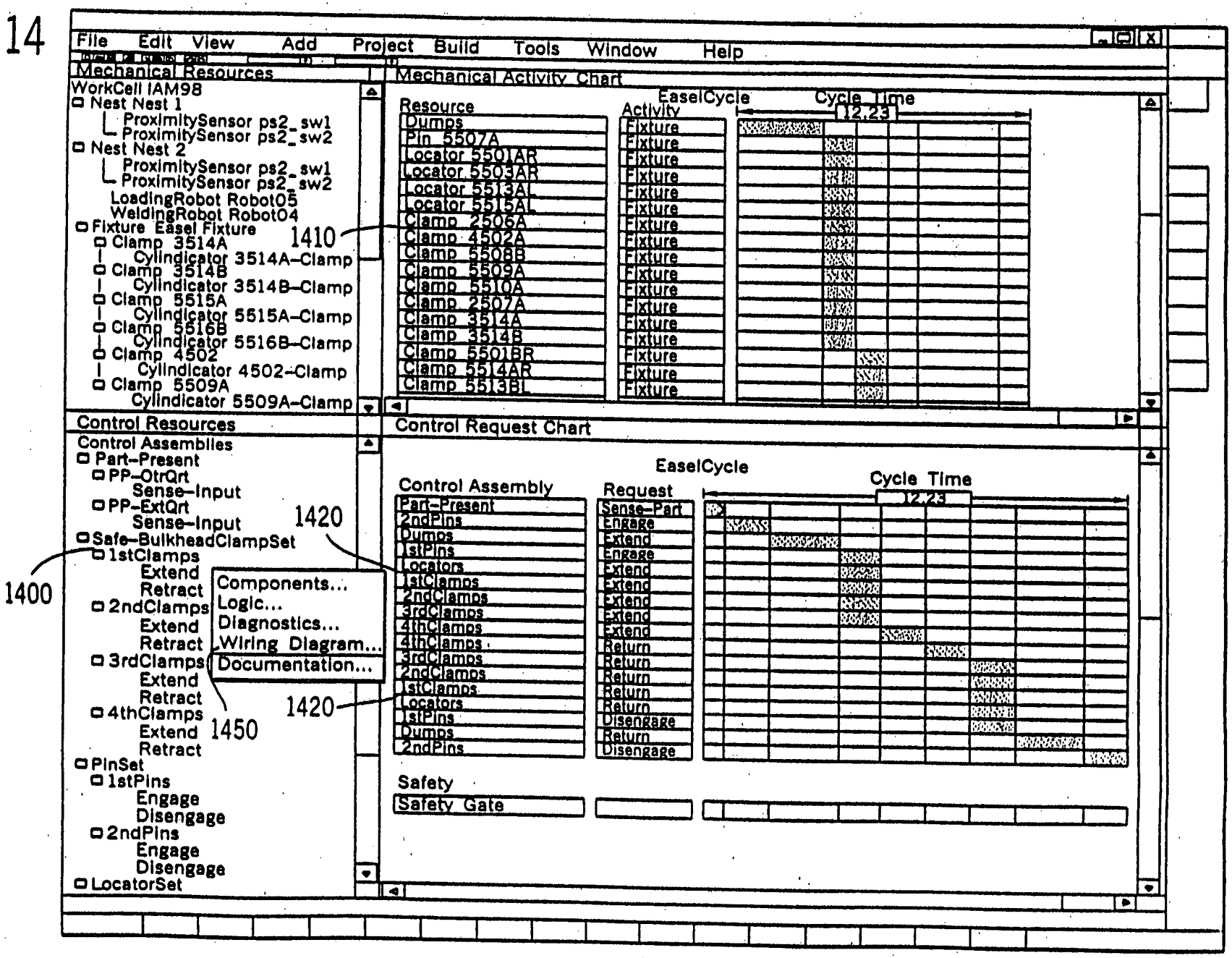

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
Cylindicator 5515A-Clamp
Clamp 5516B
Cylindicator 5516B-Clamp
Clamp 4502
Cylindicator 4502-Clamp
Clamp 5509A
Cylindicator 5509A-Clamp
1410
Mechanical Activity Chart
EaselCycle
Cycle Time
12.23
Resource
Activity
Dumps
Pin 5507A
Locator 5501AR
Locator 5503AR
Locator 5513AL
Locator 5515AL
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Clamp 5501BR
Clamp 5514AR
Clamp 5513BL
Fixture
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
Sense-Input
PP-ExtQrt
Sense-Input
Safe-BulkheadClampSet
1stClamps
Extend
Retract
2ndClamps
Extend
Retract
3rdClamps
Extend
Retract
4thClamps
Extend
Retract
PinSet
1stPins
Engage
Disengage
2ndPins
Engage
Disengage
LocatorSet
1400
1420
1450
Components...
Logic...
Diagnostics...
Wiring Diagram...
Documentation...
Control Request Chart
EaselCycle
Cycle Time
12.23
Control Assembly
Request
Part-Present
2ndPins
Dumps
1stPins
Locators
1stClamps
2ndClamps
3rdClamps
4thClamps
4thClamps
3rdClamps
2ndClamps
1stClamps
Locators
1stPins
Dumps
2ndPins
Sense-Part
Engage
Extend
Engage
Extend
Extend
Extend
Extend
Return
Return
Return
Return
Return
Disengage
Return
Disengage
Safety
Safety Gate

FIG. 15

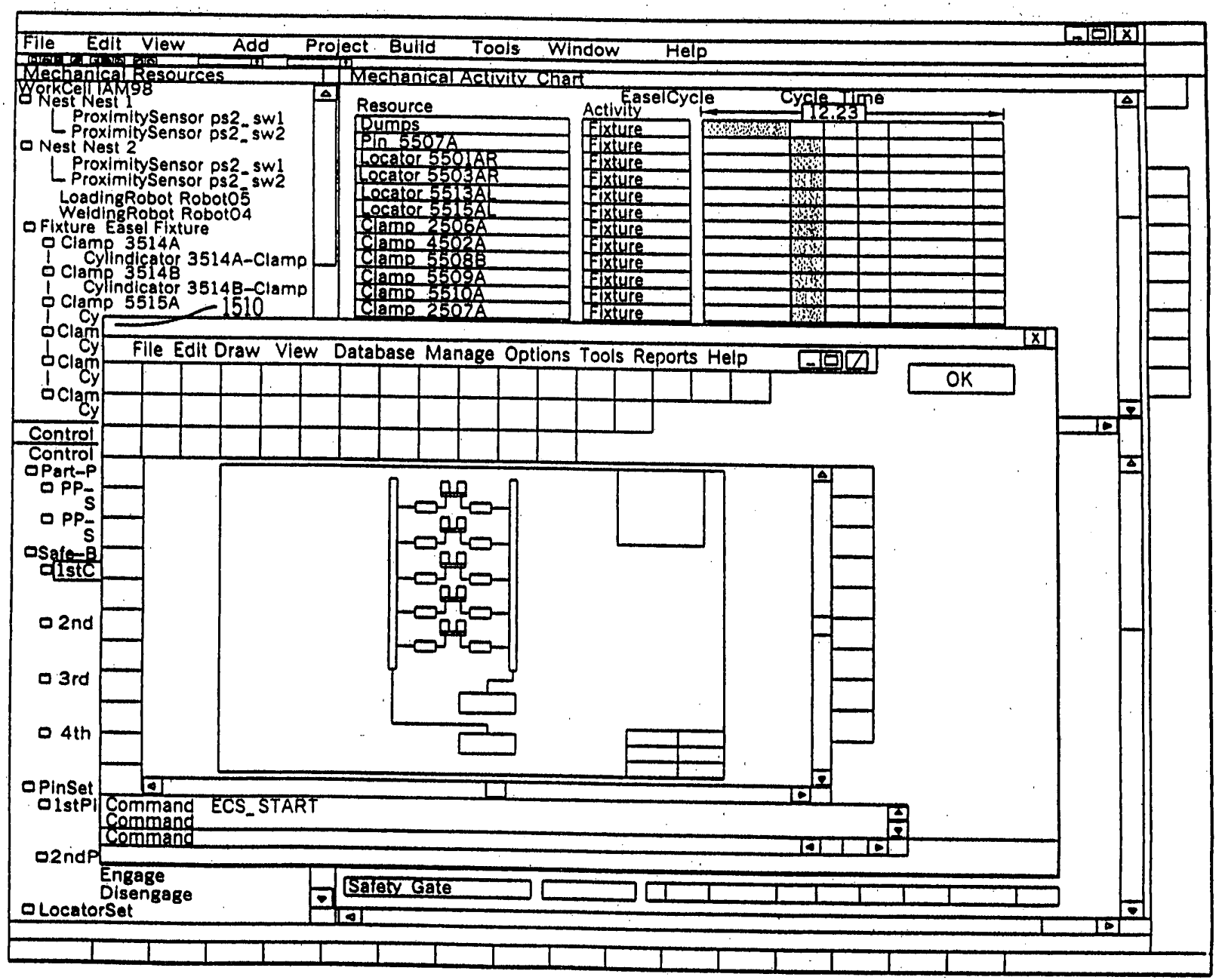

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
1510
Mechanical Activity Chart
Resource
Activity
EaselCycle
Cycle Time
12.23
Dumps
Pin 5507A
Locator 5501AR
Locator 5503AR
Locator 5513AL
Locator 5515AL
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 2507A
Fixture
File Edit Draw View Database Manage Options Tools Reports Help
OK
Control
Control
Part-P
PP-S
PP-S
Safe-B
1stC
2nd
3rd
4th
PinSet
1stPi
2ndP
Command
Command
Command
ECS_START
Engage
Disengage
LocatorSet
Safety Gate

FIG. 16

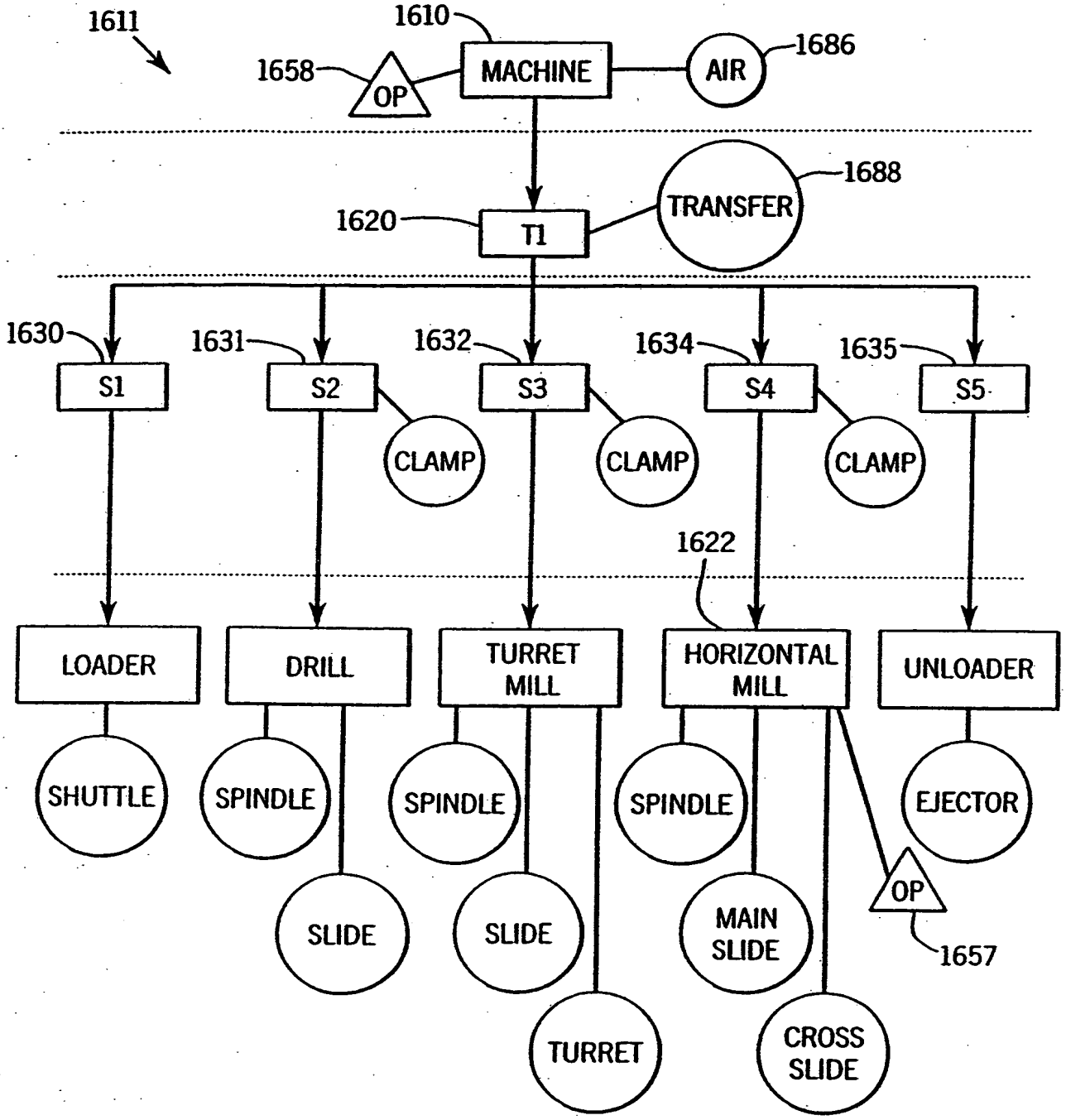

1611
1610
MACHINE
1658
OP
AIR
1686
1620
T1
TRANSFER
1688
1630
1631
1632
1634
1635
S1
S2
S3
S4
S5
CLAMP
CLAMP
CLAMP
1622
LOADER
DRILL
TURRET MILL
HORIZONTAL MILL
UNLOADER
SHUTTLE
SPINDLE
SPINDLE
SPINDLE
EJECTOR
SLIDE
SLIDE
MAIN SLIDE
OP
1657
TURRET
CROSS SLIDE

FIG. 17

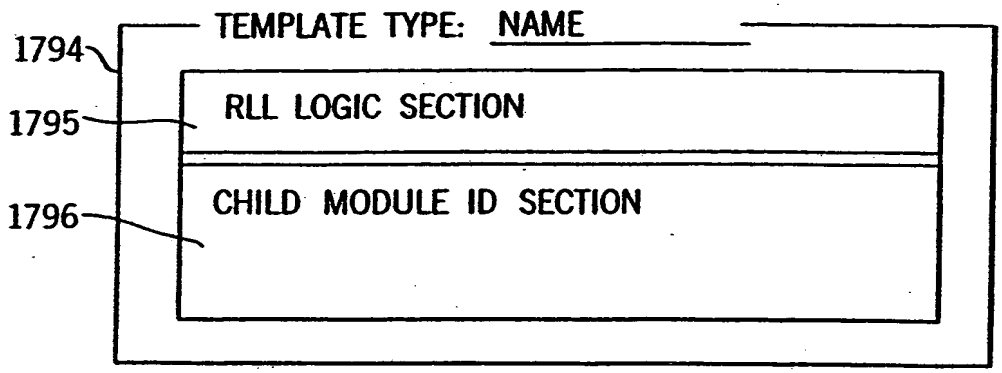

TEMPLATE TYPE: NAME
1794
RLL LOGIC SECTION
1795
CHILD MODULE ID SECTION
1796

FIG. 23

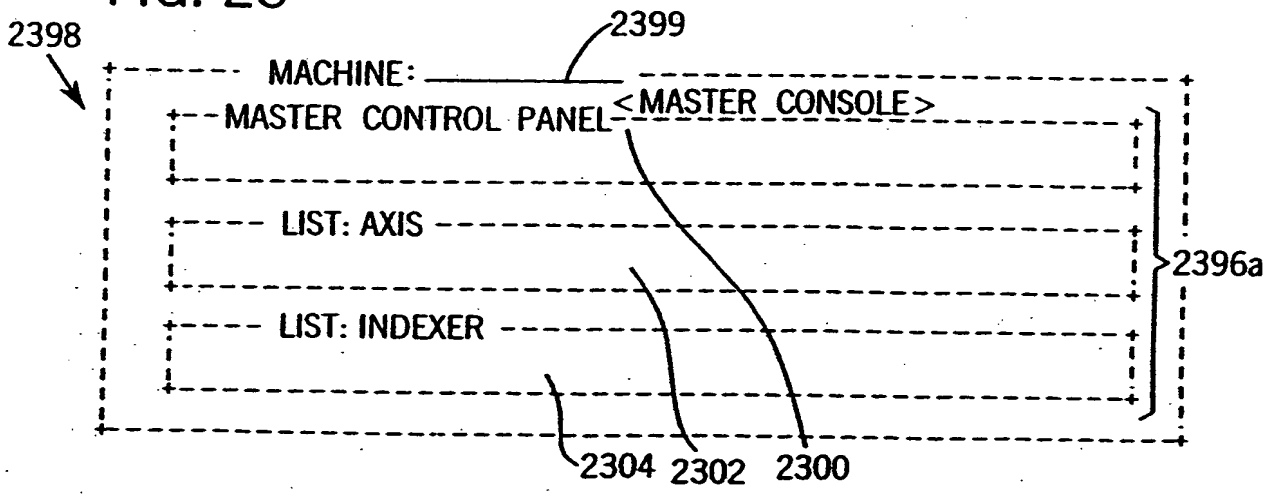

2398
2399
MACHINE:
MASTER CONTROL PANEL
<MASTER CONSOLE>
LIST: AXIS
LIST: INDEXER
2396a
2304
2302
2300

FIG. 18

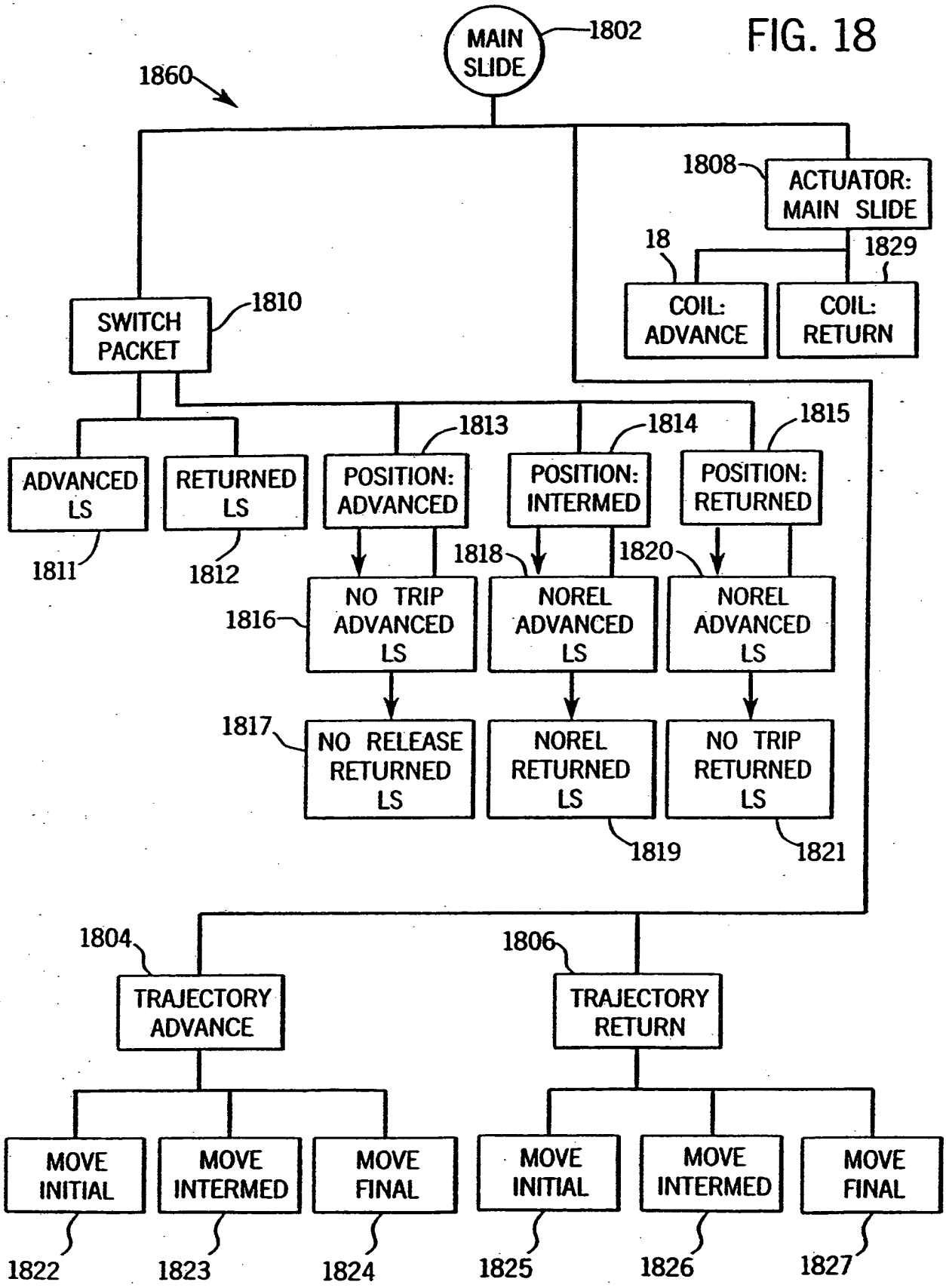

MAIN SLIDE
1802
1860
1808
ACTUATOR: MAIN SLIDE
18
1829
COIL: ADVANCE
COIL: RETURN
SWITCH PACKET
1810
ADVANCED LS
RETURNED LS
POSITION: ADVANCED
POSITION: INTERMED
POSITION: RETURNED
1813
1814
1815
1811
1812
1818
1820
1816
NO TRIP ADVANCED LS
NOREL ADVANCED LS
NOREL ADVANCED LS
1817
NO RELEASE RETURNED LS
NOREL RETURNED LS
NO TRIP RETURNED LS
1819
1821
1804
1806
TRAJECTORY ADVANCE
TRAJECTORY RETURN
MOVE INITIAL
MOVE INTERMED
MOVE FINAL
MOVE INITIAL
MOVE INTERMED
MOVE FINAL
1822
1823
1824
1825
1826
1827

FIG. 19

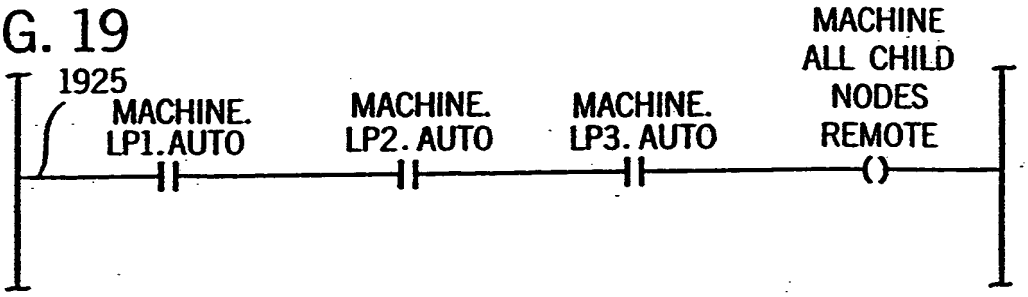


FIG. 20

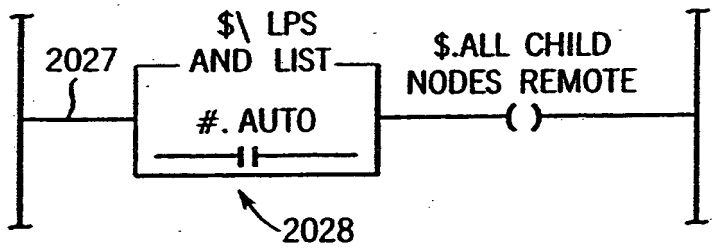


FIG. 21

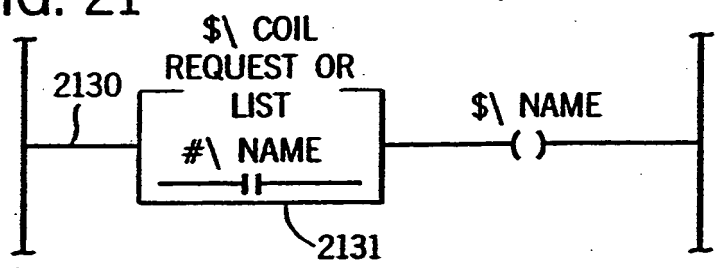
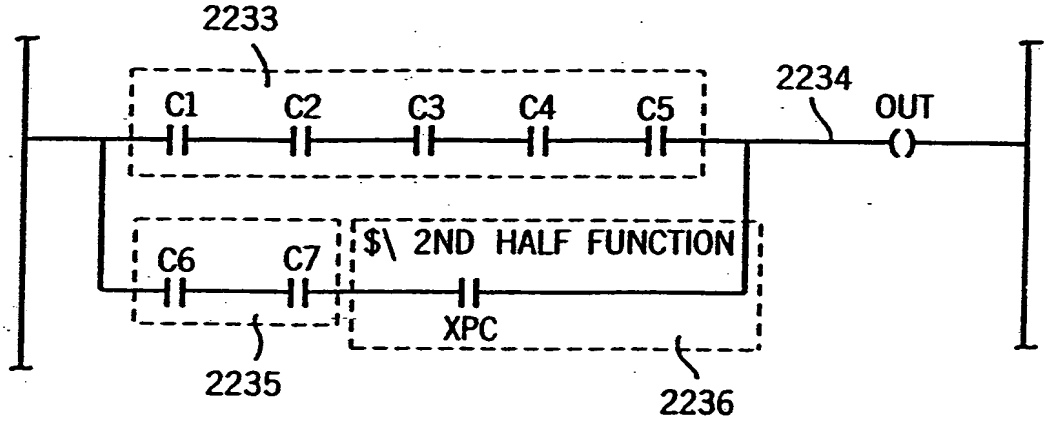


FIG. 22



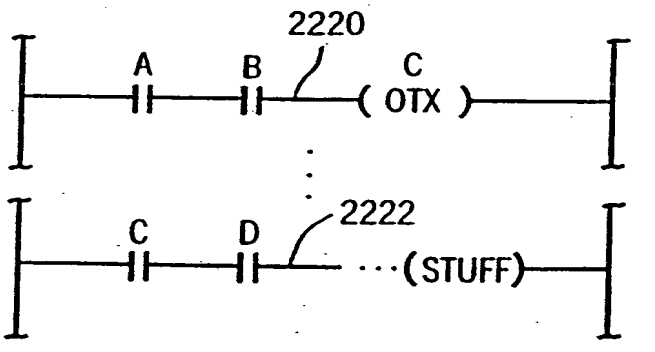


FIG. 22-1

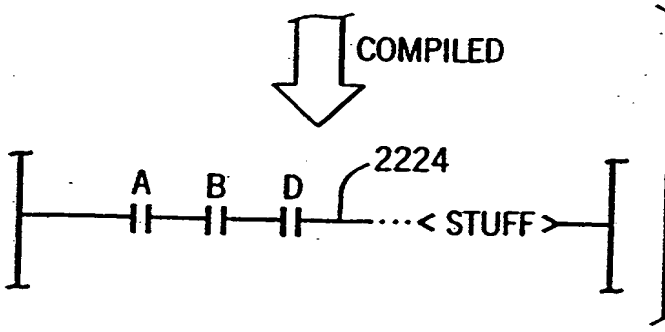


FIG. 22-2

FIG. 24

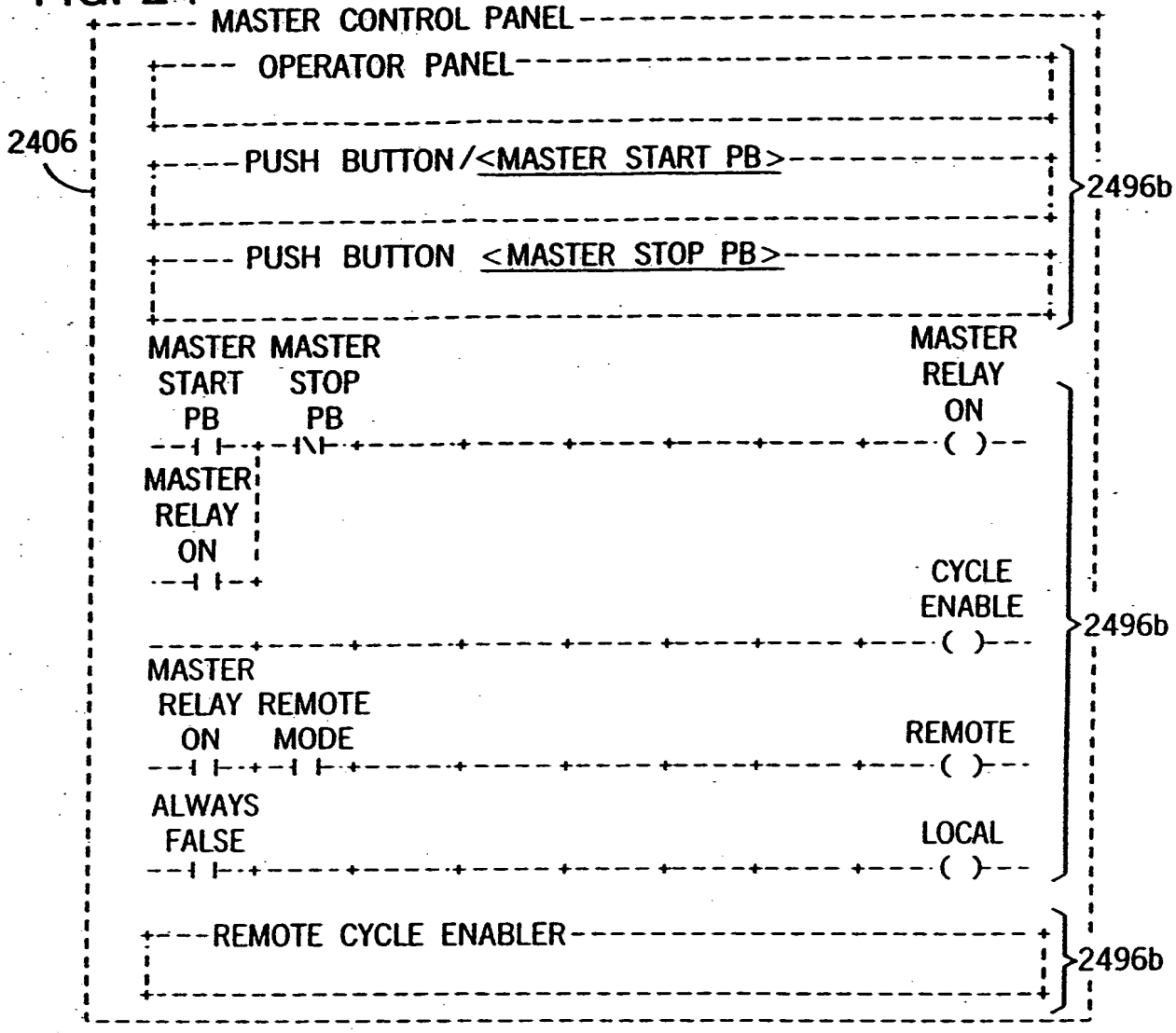

MASTER CONTROL PANEL
OPERATOR PANEL
2406
PUSH BUTTON/<MASTER START PB>
PUSH BUTTON <MASTER STOP PB>
2496b
MASTER START PB
MASTER STOP PB
MASTER RELAY ON
MASTER RELAY ON
CYCLE ENABLE
MASTER RELAY ON
REMOTE MODE
REMOTE
ALWAYS FALSE
LOCAL
2496b
REMOTE CYCLE ENABLER
2496b

FIG. 25

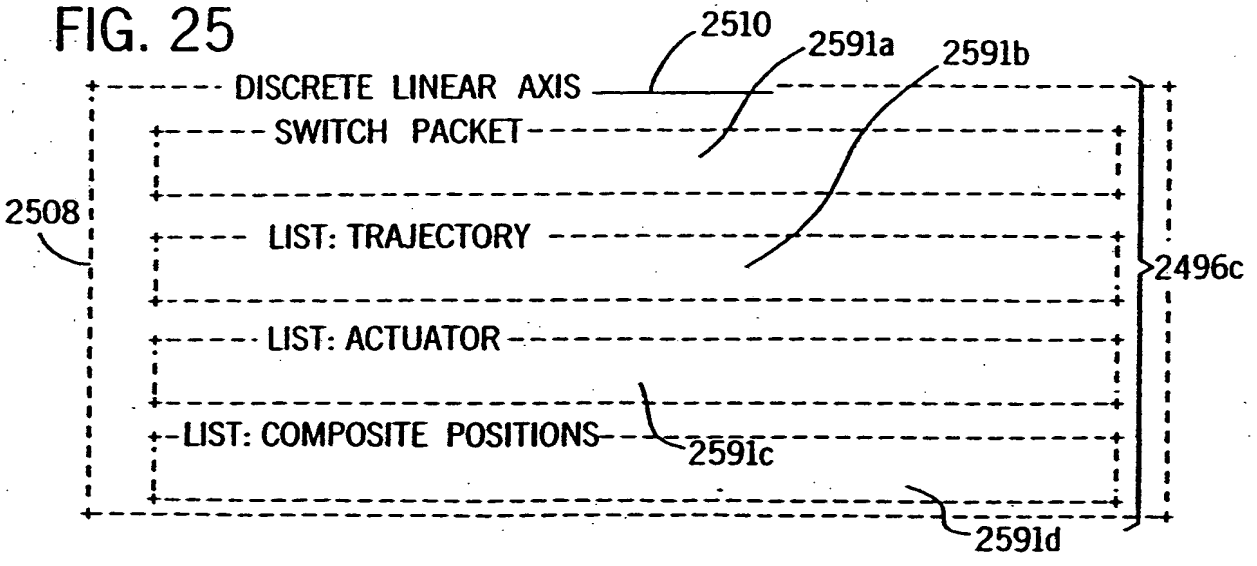

2510
2591a
2591b
DISCRETE LINEAR AXIS
SWITCH PACKET
2508
LIST: TRAJECTORY
2496c
LIST: ACTUATOR
LIST: COMPOSITE POSITIONS
2591c
2591d

FIG. 26

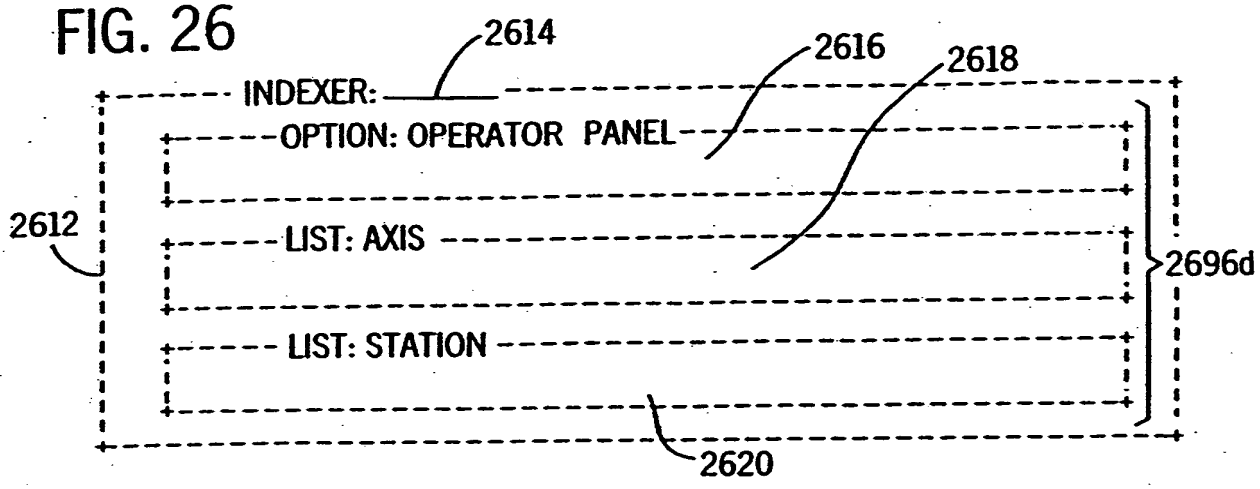


FIG. 27

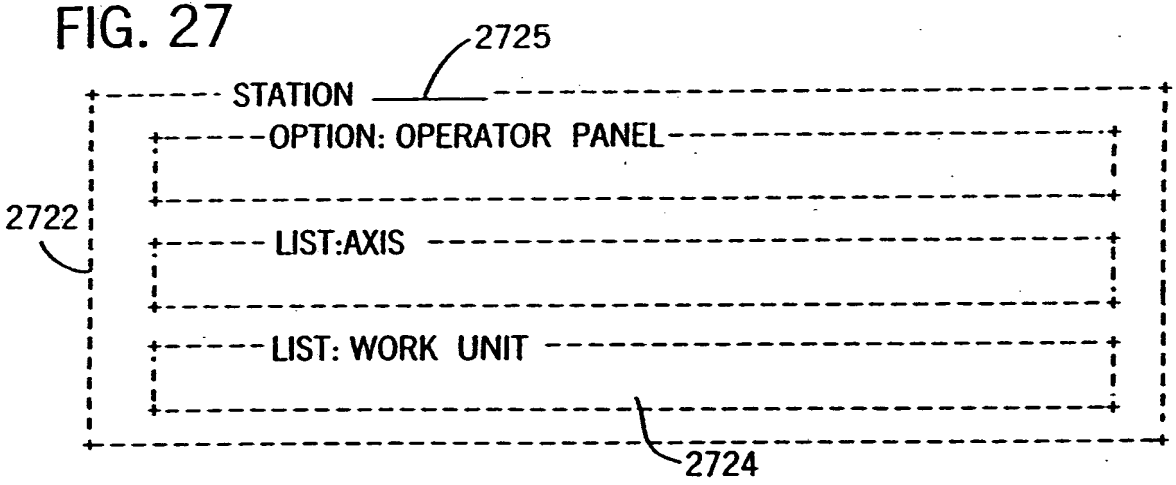


FIG. 28

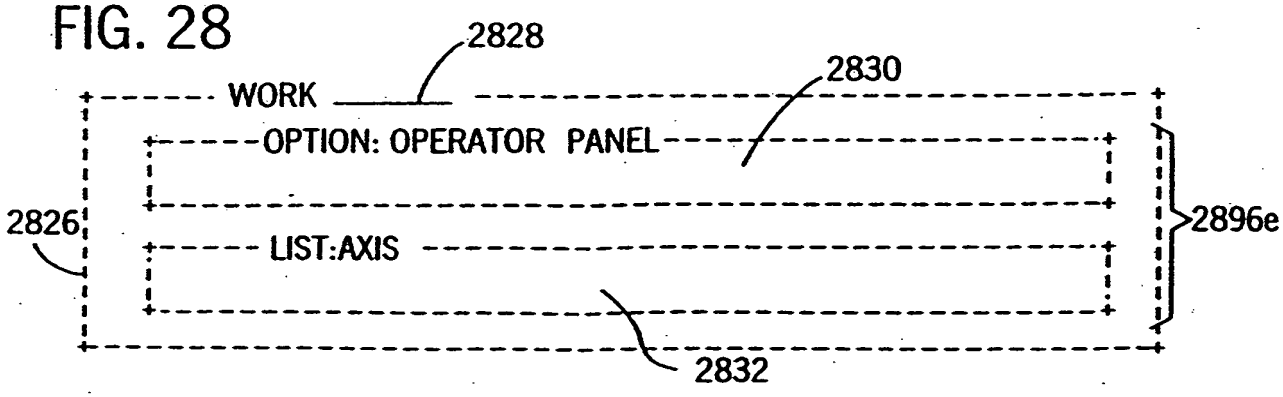


FIG. 29

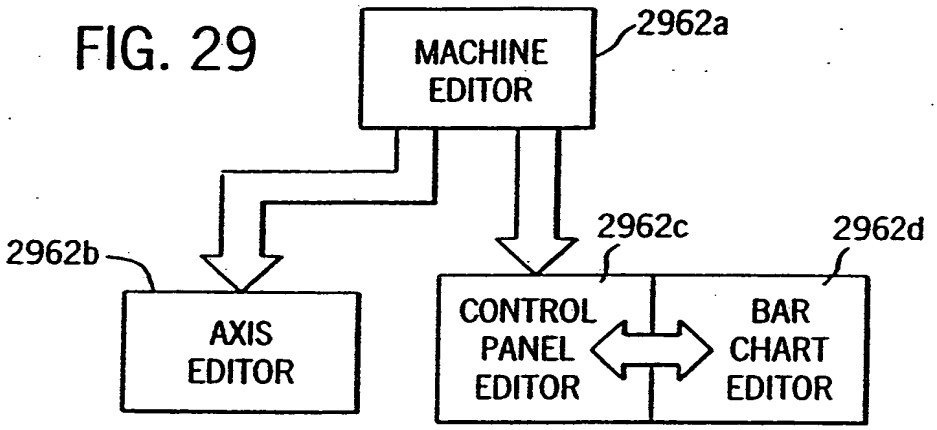

MACHINE EDITOR
2962a
2962b
AXIS EDITOR
2962c
CONTROL PANEL EDITOR
2962d
BAR CHART EDITOR

FIG. 30

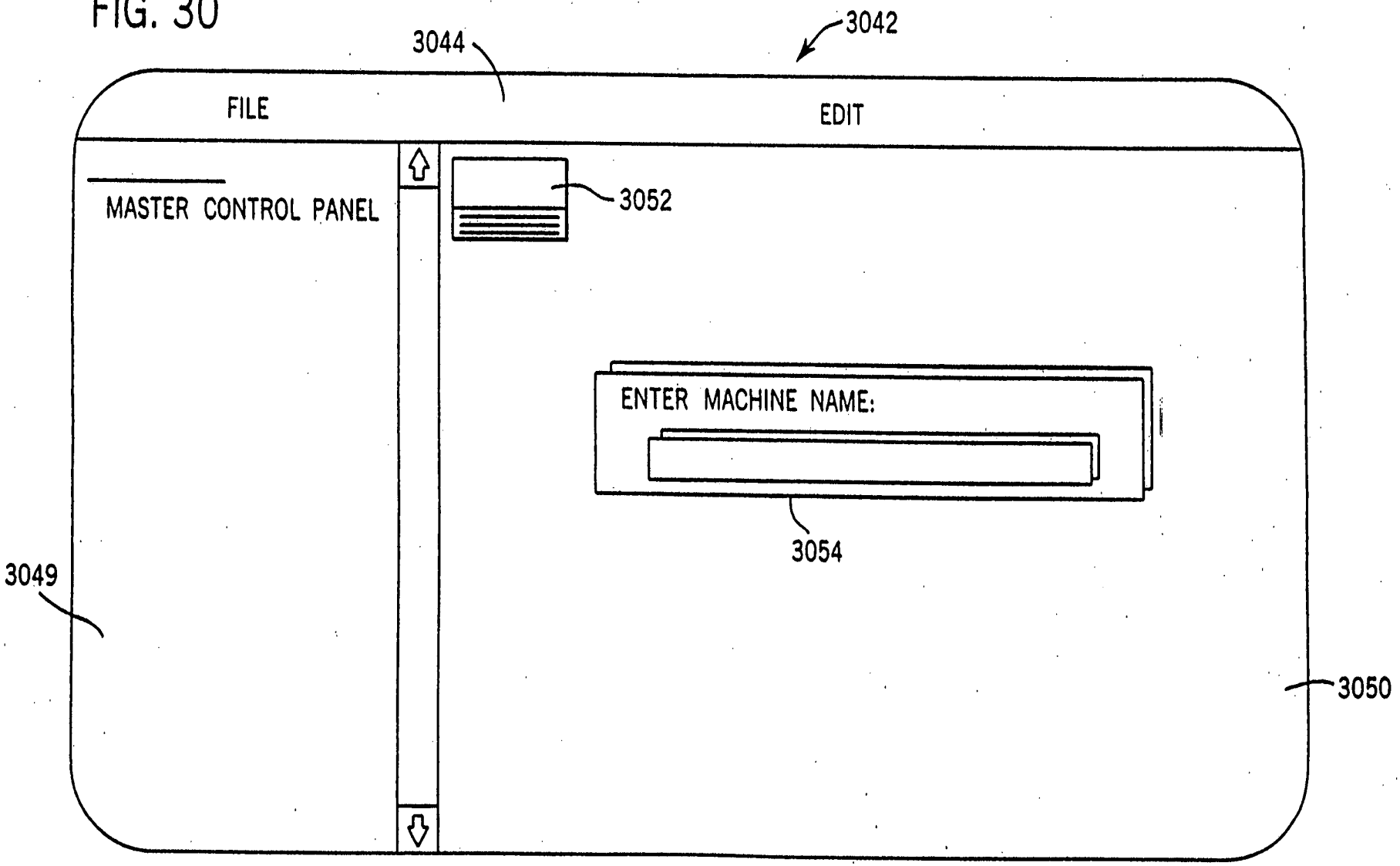
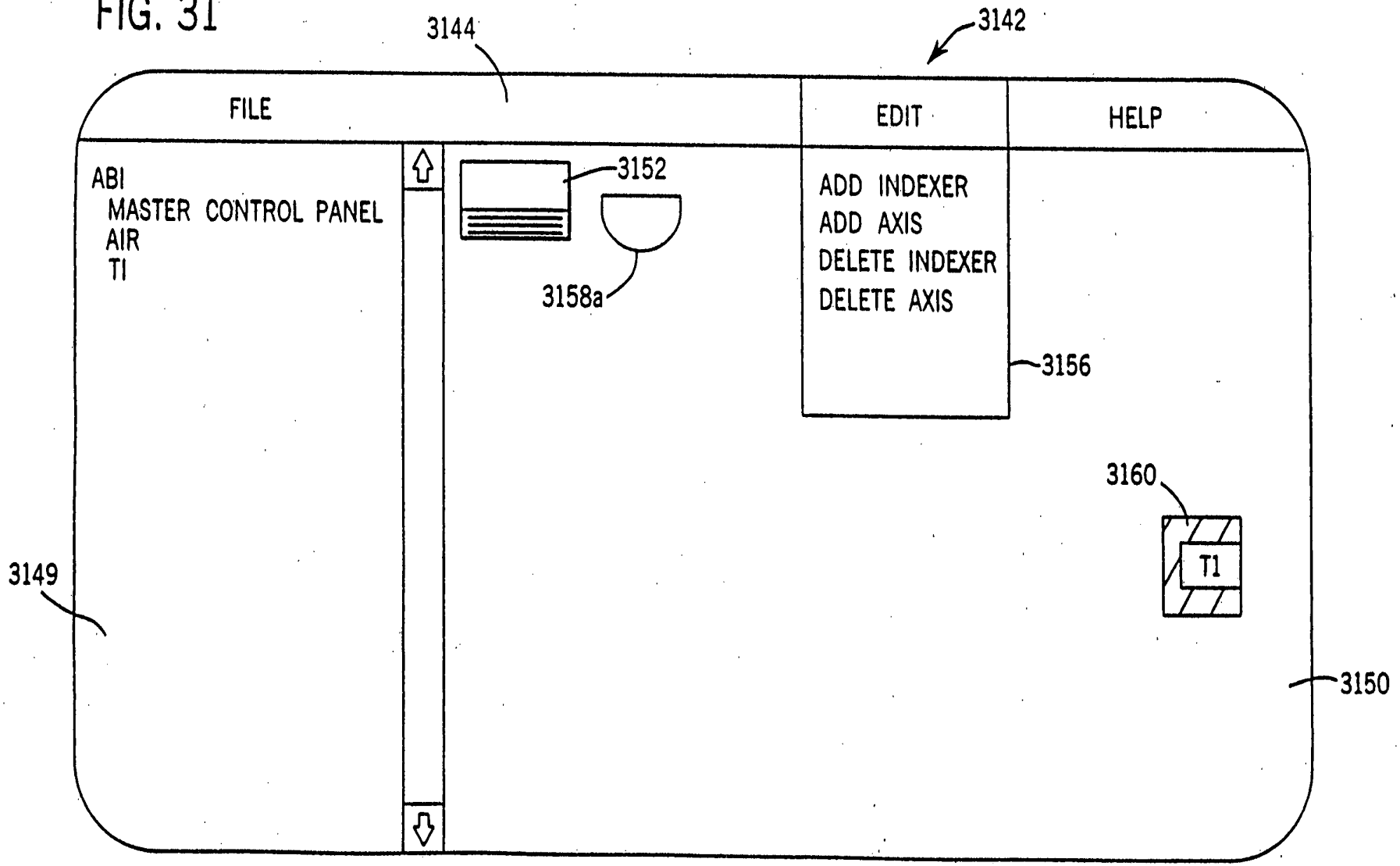

3042
3044
FILE
EDIT
MASTER CONTROL PANEL
3052
ENTER MACHINE NAME:
3054
3049
3050

FIG. 31


3144
3142
FILE
EDIT
HELP
ABI
MASTER CONTROL PANEL
AIR
TI
3152
3158a
ADD INDEXER
ADD AXIS
DELETE INDEXER
DELETE AXIS
3156
3160
T1
3149
3150

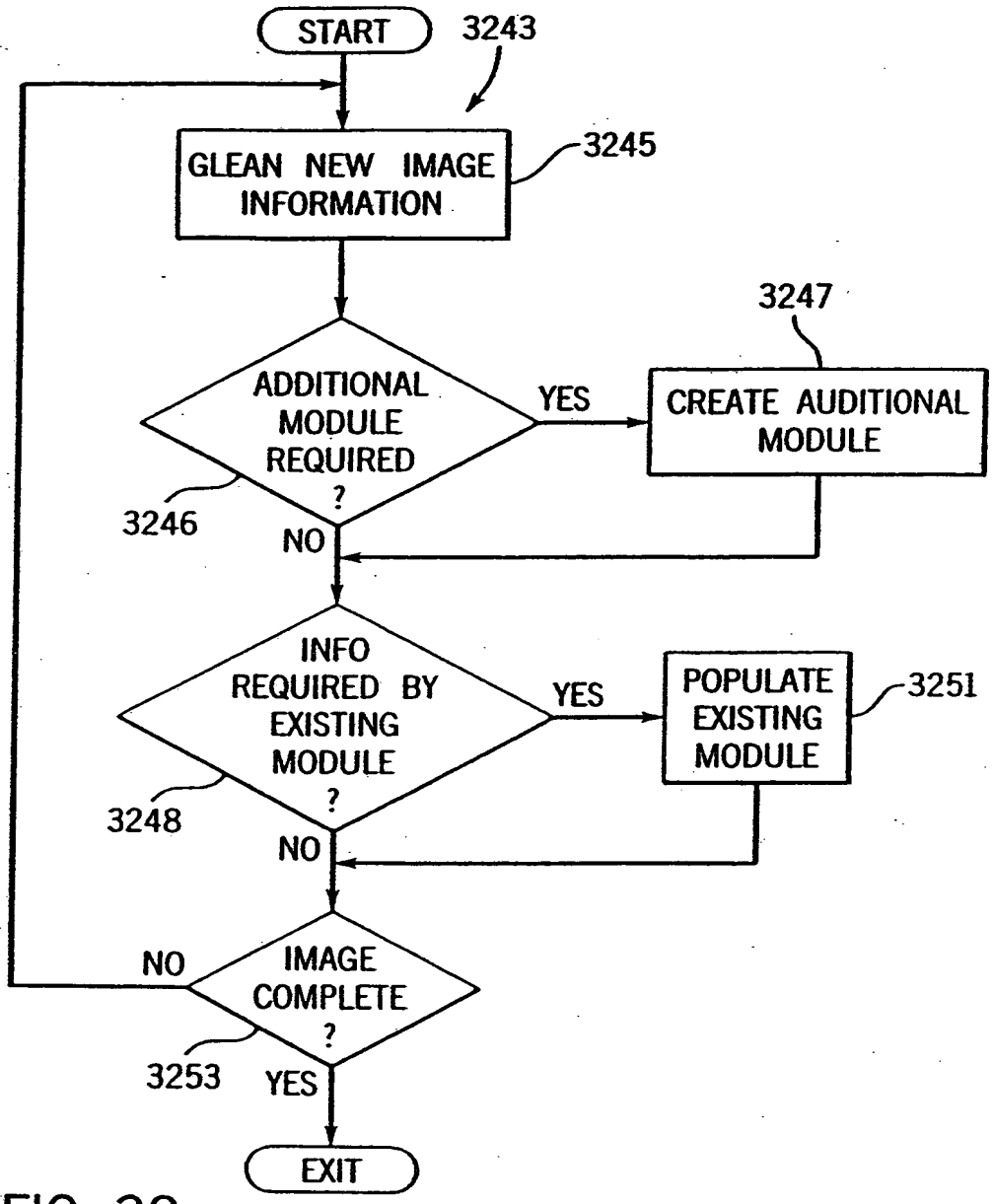

START
3243
GLEAN NEW IMAGE INFORMATION
3245
3247
ADDITIONAL MODULE REQUIRED ?
YES
CREATE AUDITIONAL MODULE
3246
NO
INFO REQUIRED BY EXISTING MODULE ?
YES
POPULATE EXISTING MODULE
3251
3248
NO
NO
IMAGE COMPLETE ?
3253
YES
EXIT

FIG. 32

FIG. 33

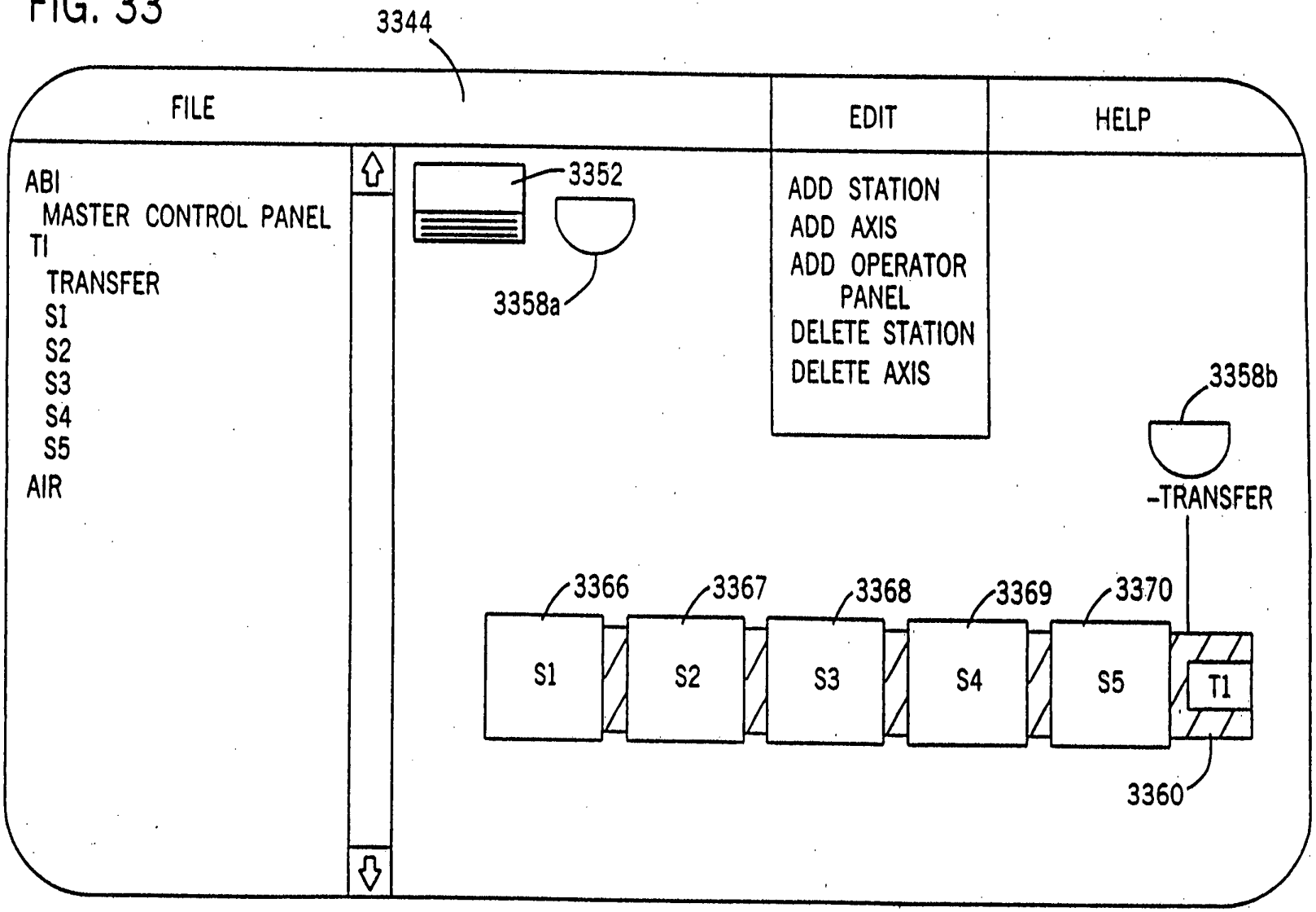
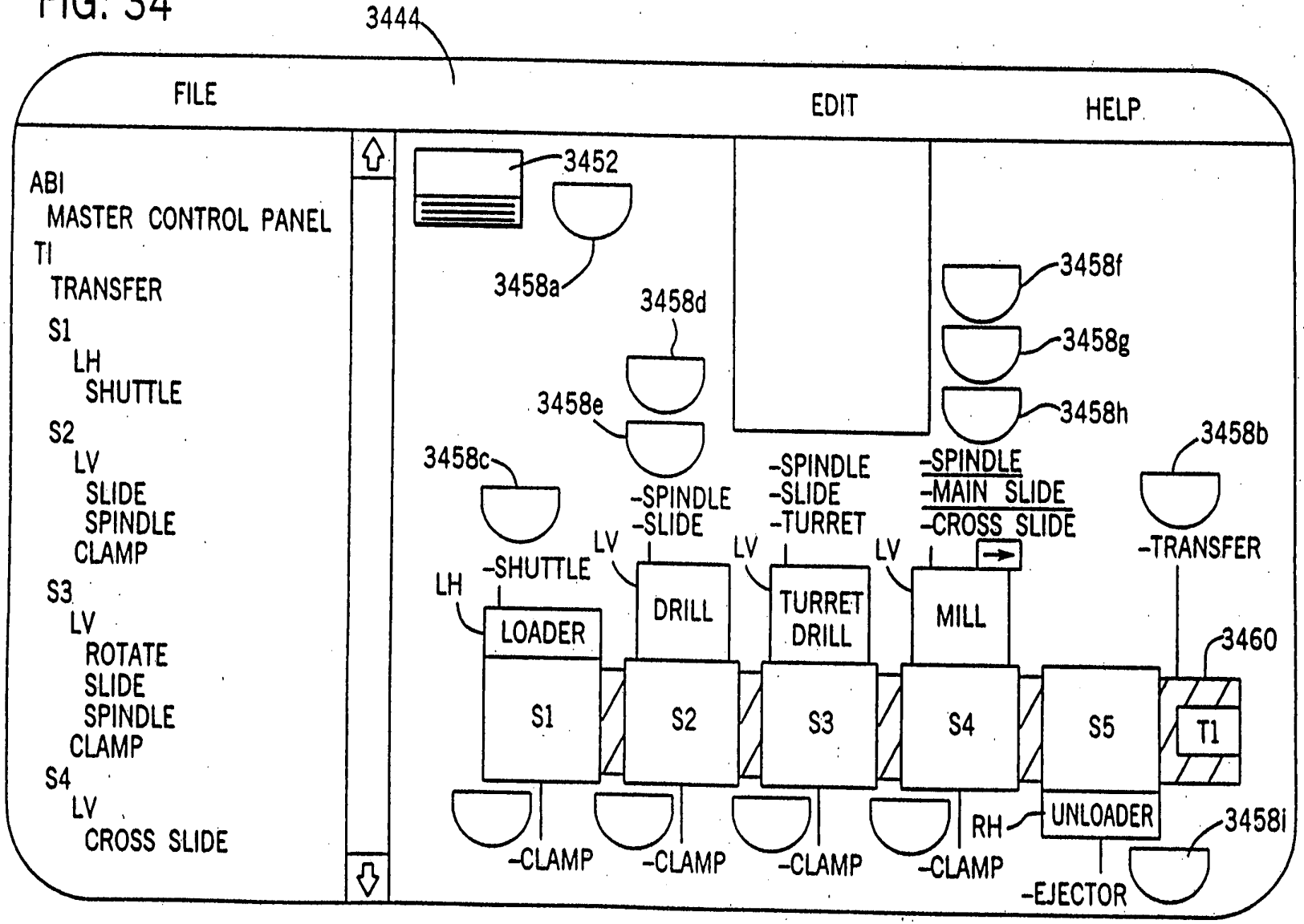

3344
FILE
EDIT
HELP
ABI
MASTER CONTROL PANEL
TI
TRANSFER
S1
S2
S3
S4
S5
AIR
3352
3358a
ADD STATION
ADD AXIS
ADD OPERATOR PANEL
DELETE STATION
DELETE AXIS
3358b
-TRANSFER
3366
3367
3368
3369
3370
S1
S2
S3
S4
S5
T1
3360

FIG. 34


3444
FILE
EDIT
HELP
ABI
MASTER CONTROL PANEL
TI
TRANSFER
S1
LH
SHUTTLE
S2
LV
SLIDE
SPINDLE
CLAMP
S3
LV
ROTATE
SLIDE
SPINDLE
CLAMP
S4
LV
CROSS SLIDE
3452
3458a
3458d
3458e
3458c
3458f
3458g
3458h
3458b
-SPINDLE
-SLIDE
-SPINDLE
-SLIDE
-TURRET
-SPINDLE
-MAIN SLIDE
-CROSS SLIDE
-TRANSFER
LH
-SHUTTLE
LV
LV
LV
LOADER
DRILL
TURRET DRILL
MILL
3460
S1
S2
S3
S4
S5
T1
-CLAMP
-CLAMP
-CLAMP
-CLAMP
RH
UNLOADER
3458i
-EJECTOR

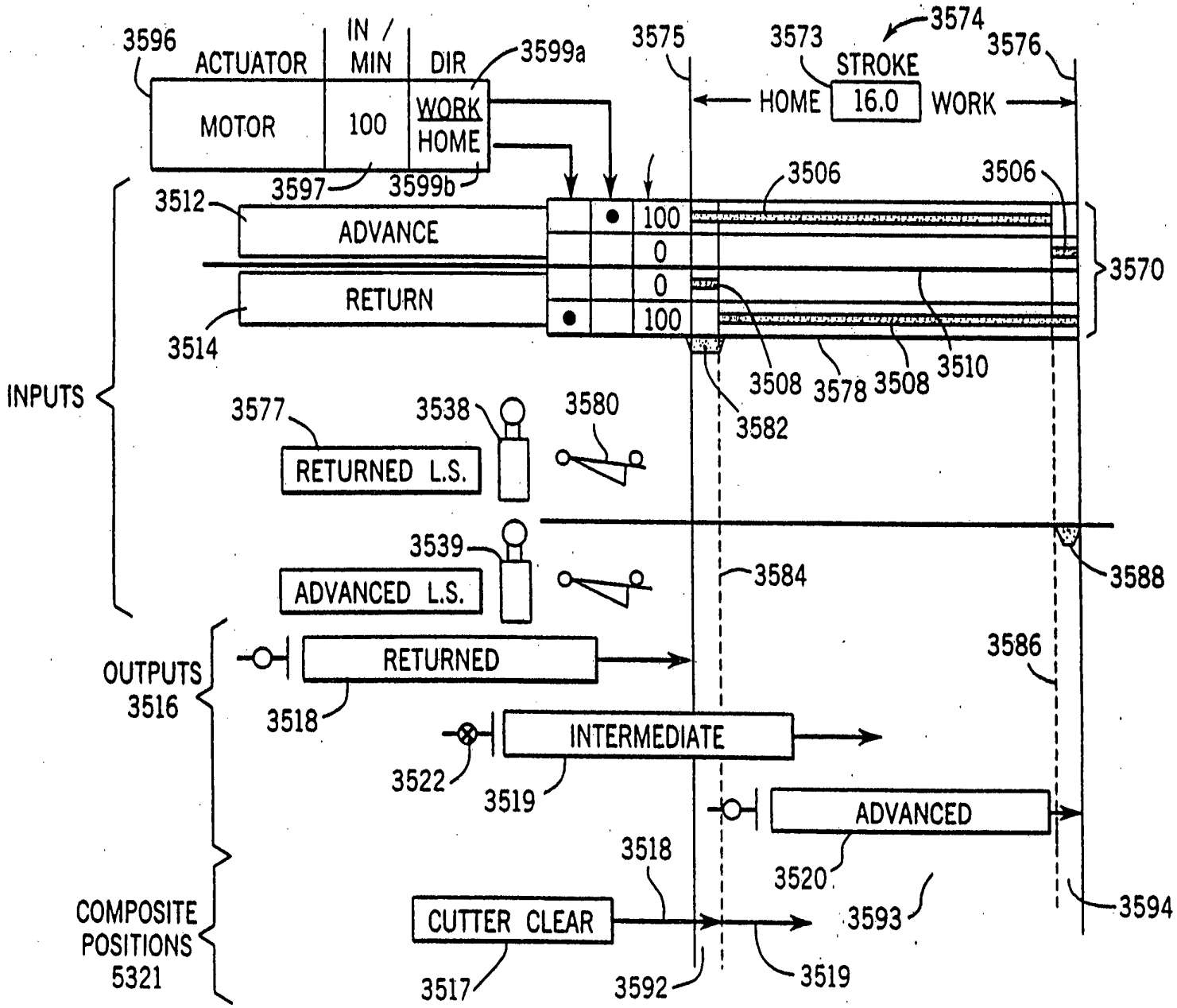

3596
ACTUATOR
IN / MIN
DIR
3599a
MOTOR
100
WORK
HOME
3597
3599b
3575
3573
3574
STROKE
16.0
3576
HOME
WORK
3512
ADVANCE
RETURN
3514
3506
3506
100
0
0
100
3570
3508
3578
3508
3510
3582
INPUTS
3577
RETURNED L.S.
3538
3580
3539
ADVANCED L.S.
3584
3588
OUTPUTS
3516
RETURNED
3518
3586
INTERMEDIATE
3522
3519
ADVANCED
3520
3518
COMPOSITE
POSITIONS
5321
CUTTER CLEAR
3517
3592
3593
3519
3594

FIG. 35

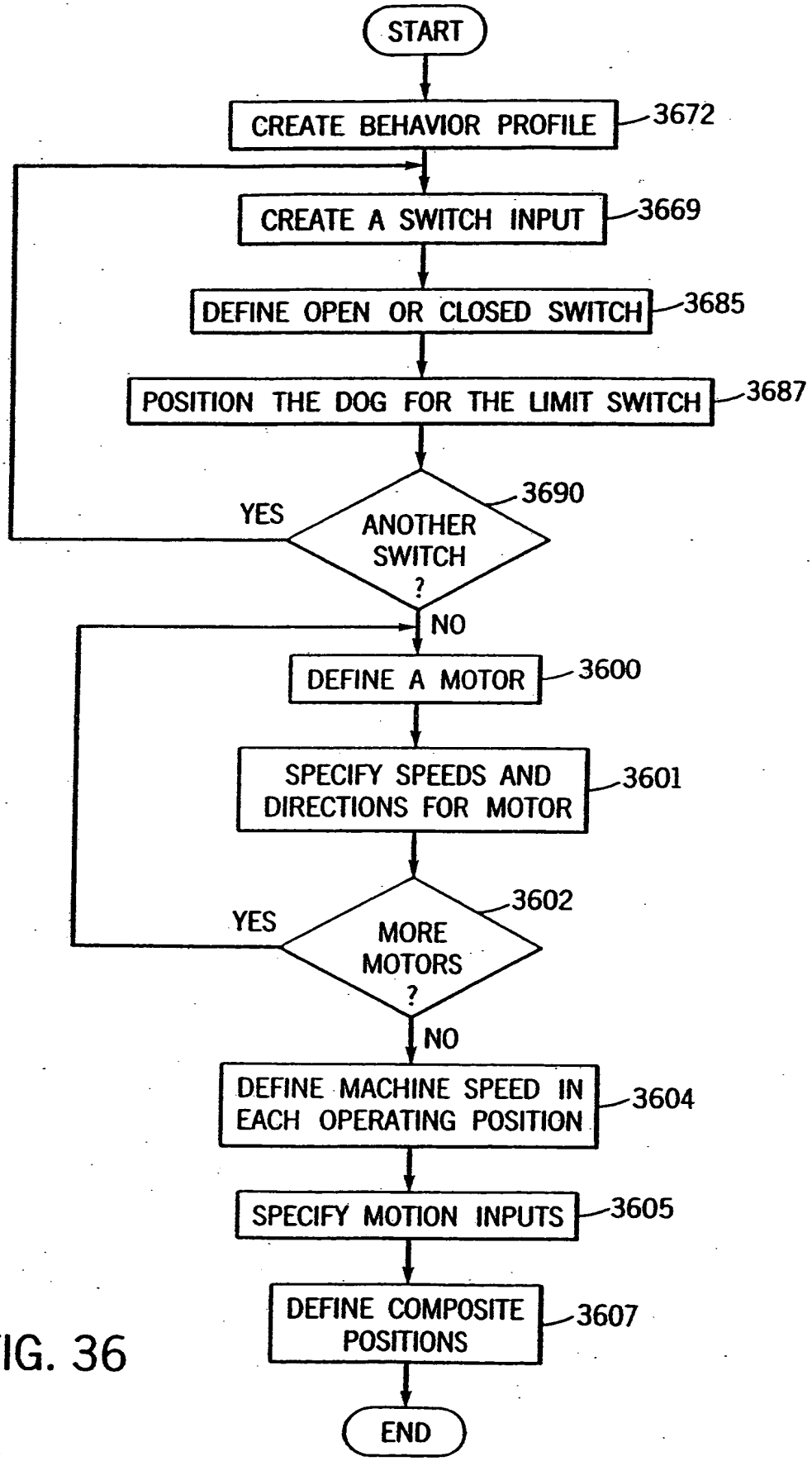

START
CREATE BEHAVIOR PROFILE
3672
CREATE A SWITCH INPUT
3669
DEFINE OPEN OR CLOSED SWITCH
3685
POSITION THE DOG FOR THE LIMIT SWITCH
3687
ANOTHER SWITCH ?
3690
YES
NO
DEFINE A MOTOR
3600
SPECIFY SPEEDS AND DIRECTIONS FOR MOTOR
3601
MORE MOTORS ?
3602
YES
NO
DEFINE MACHINE SPEED IN EACH OPERATING POSITION
3604
SPECIFY MOTION INPUTS
3605
DEFINE COMPOSITE POSITIONS
3607
END

FIG. 36

FIG. 37

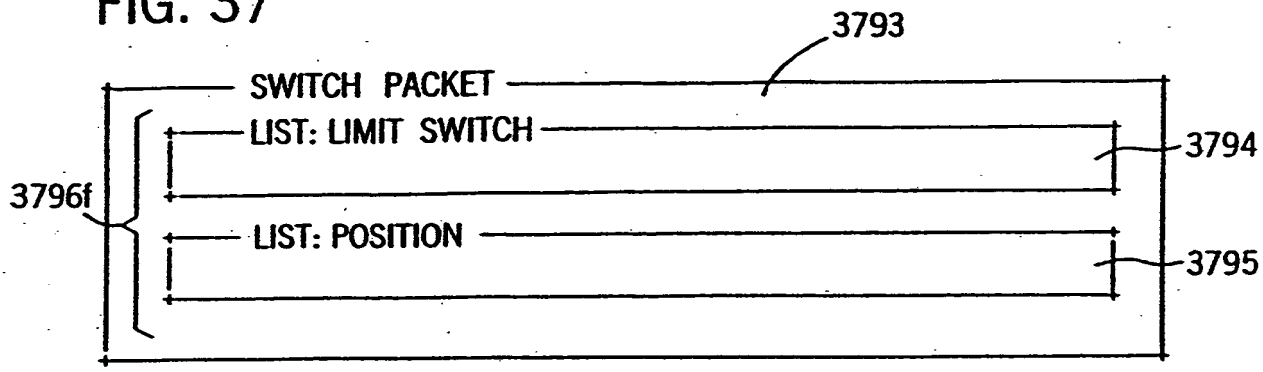

3793
SWITCH PACKET
LIST: LIMIT SWITCH
3794
3796f
LIST: POSITION
3795

FIG. 38

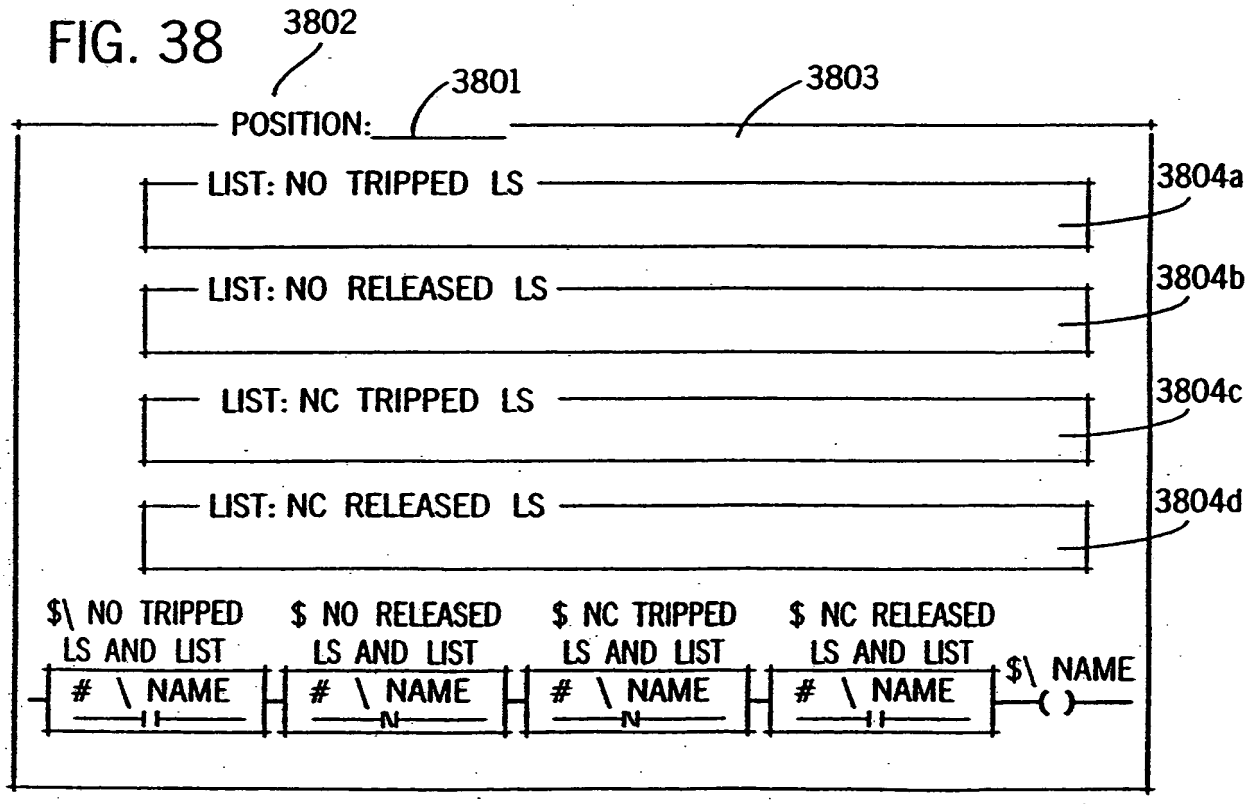

3802
3801
3803
POSITION:
LIST: NO TRIPPED LS
3804a
LIST: NO RELEASED LS
3804b
LIST: NC TRIPPED LS
3804c
LIST: NC RELEASED LS
3804d
$\ NO TRIPPED LS AND LIST
$ NO RELEASED LS AND LIST
$ NC TRIPPED LS AND LIST
$ NC RELEASED LS AND LIST
# \ NAME
# \ NAME
# \ NAME
# \ NAME
$\ NAME
N
N

FIG. 39

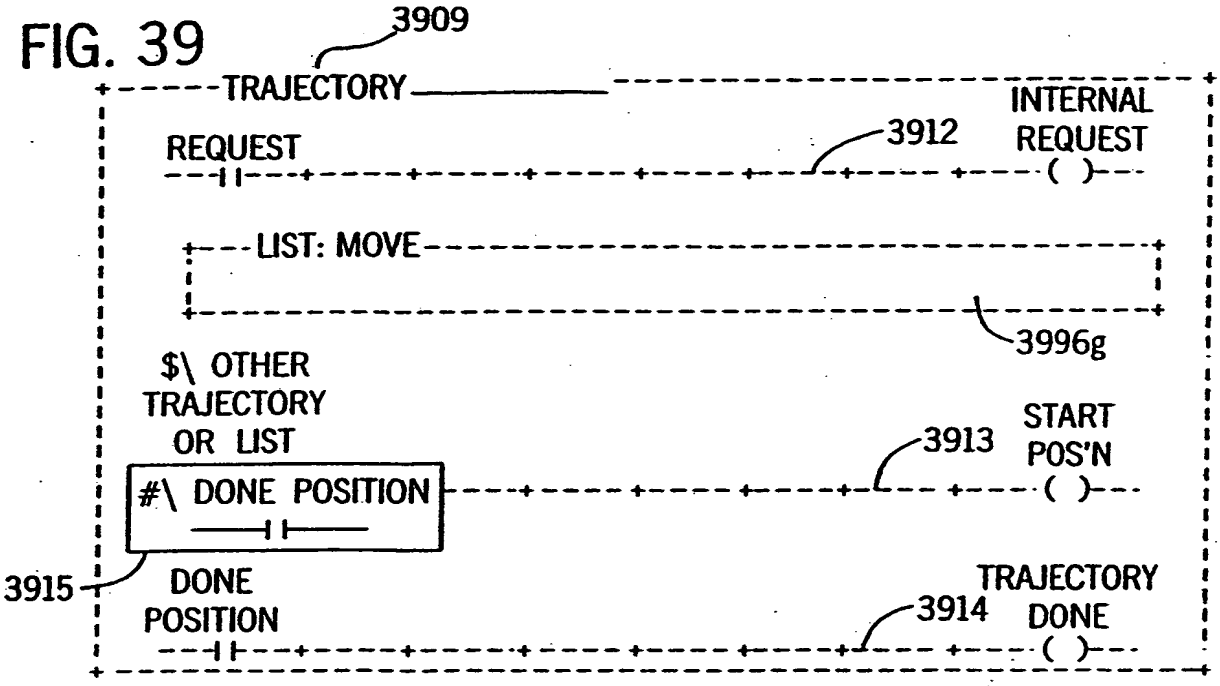


FIG. 40

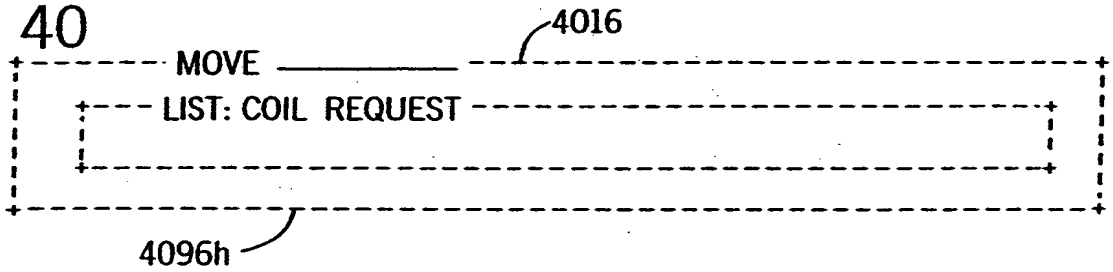


FIG. 41

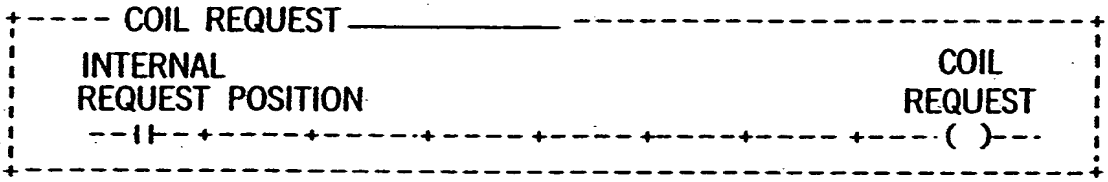


FIG. 42

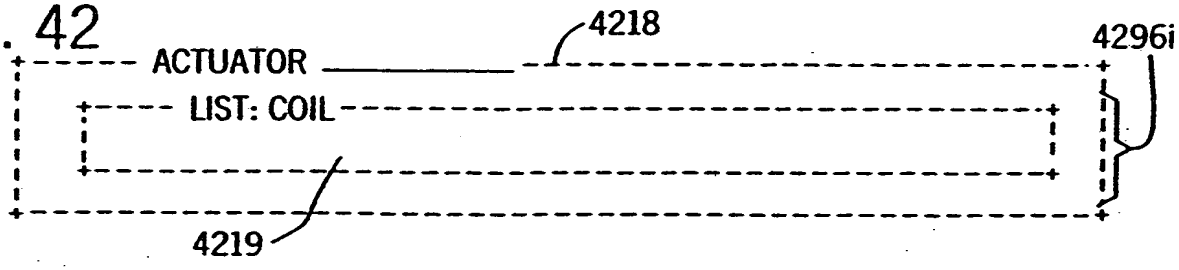


FIG. 43

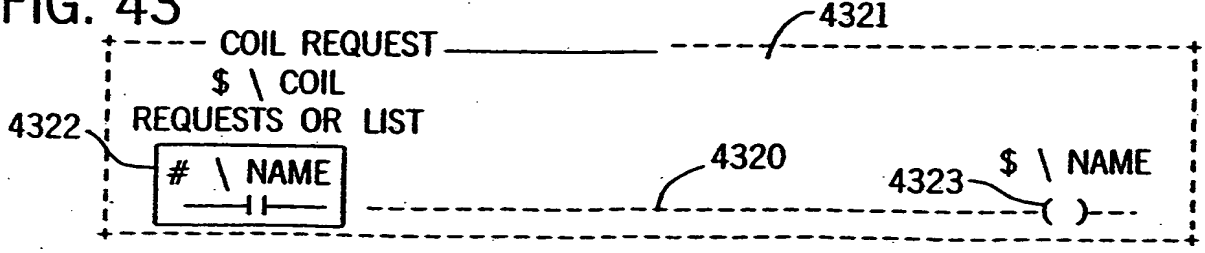


FIG. 44

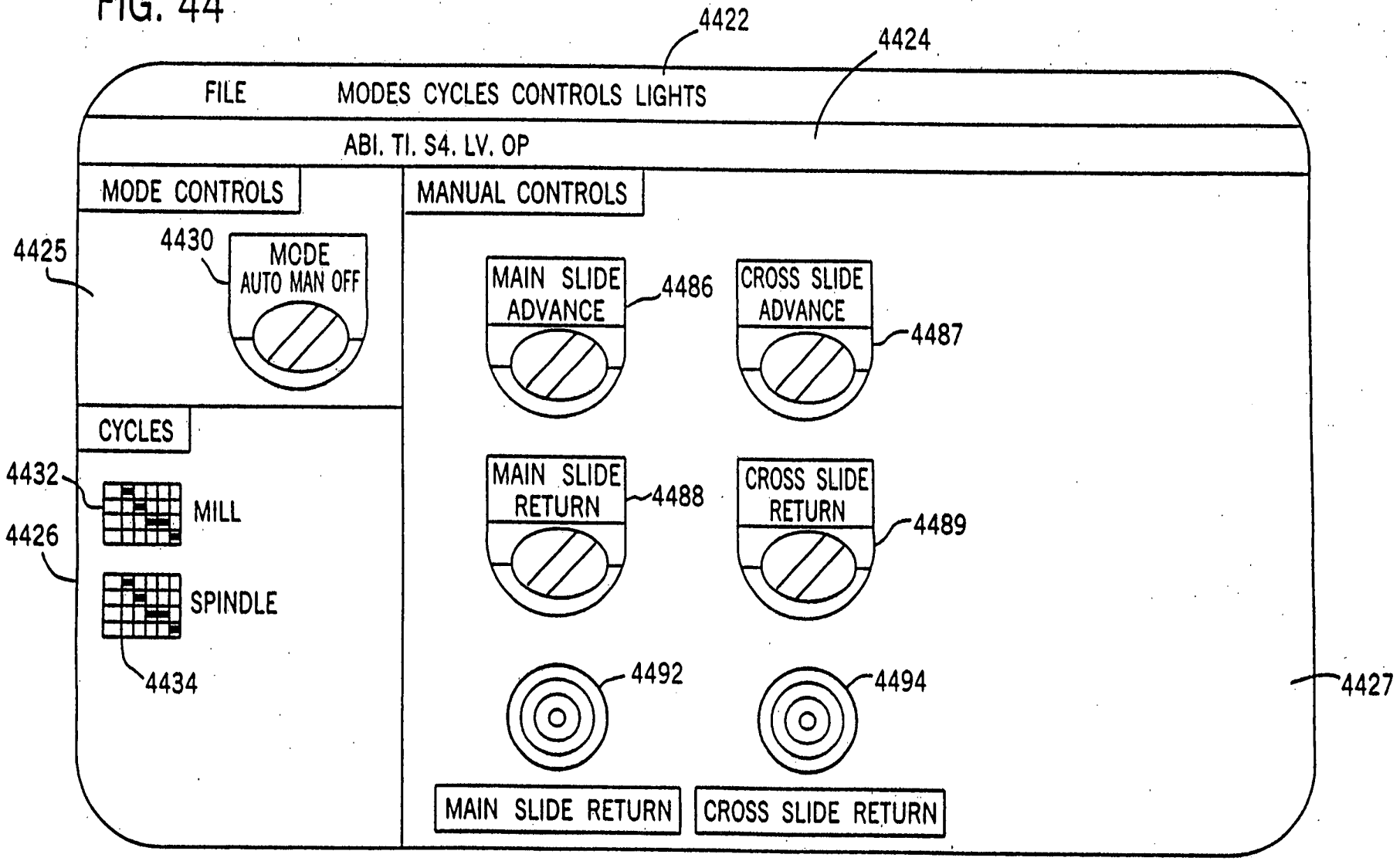

4422
4424
FILE
MODES CYCLES CONTROLS LIGHTS
ABI. TI. S4. LV. OP
MODE CONTROLS
MANUAL CONTROLS
4425
4430
MODE
AUTO MAN OFF
MAIN SLIDE ADVANCE
4486
CROSS SLIDE ADVANCE
4487
CYCLES
4432
MILL
4426
SPINDLE
4434
MAIN SLIDE RETURN
4488
CROSS SLIDE RETURN
4489
4492
4494
4427
MAIN SLIDE RETURN
CROSS SLIDE RETURN

FIG. 45

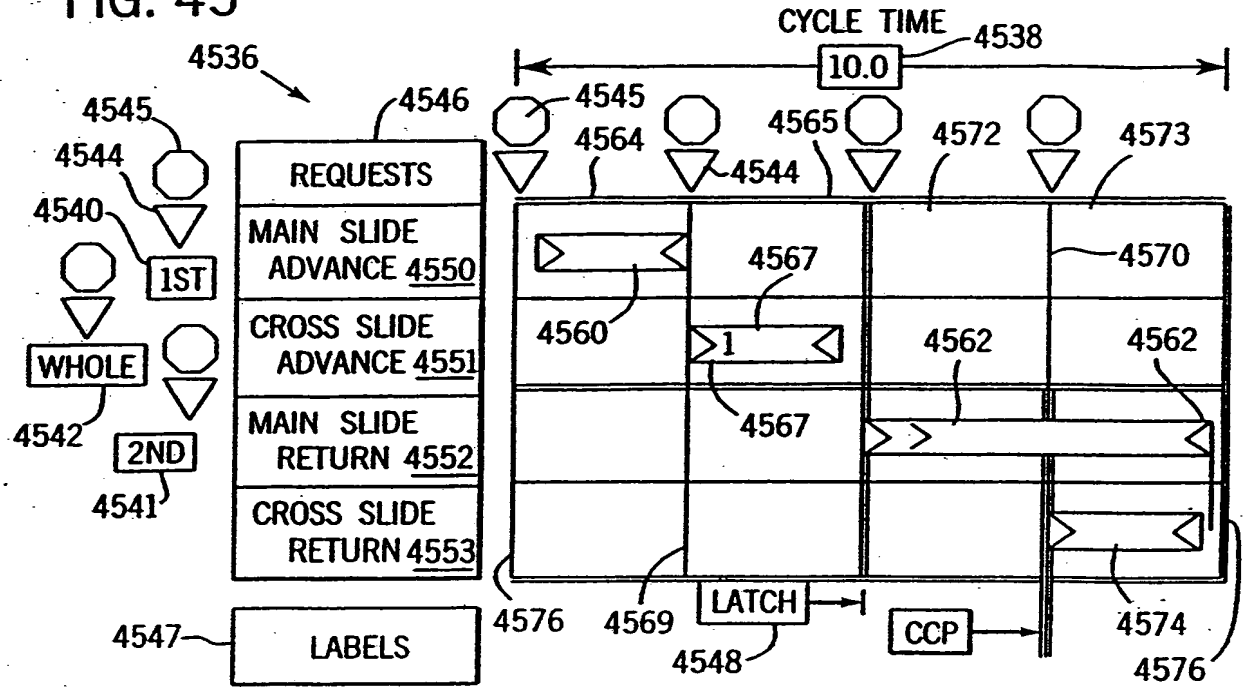

CYCLE TIME
4538
10.0
4536
4546
4545
4544
4540
1ST
WHOLE
4542
2ND
4541
REQUESTS
MAIN SLIDE ADVANCE 4550
CROSS SLIDE ADVANCE 4551
MAIN SLIDE RETURN 4552
CROSS SLIDE RETURN 4553
4547
LABELS
4545
4564
4544
4565
4572
4573
4567
4570
4560
1
4562
4562
4567
4576
4569
LATCH
4548
CCP
4574
4576

FIG. 46

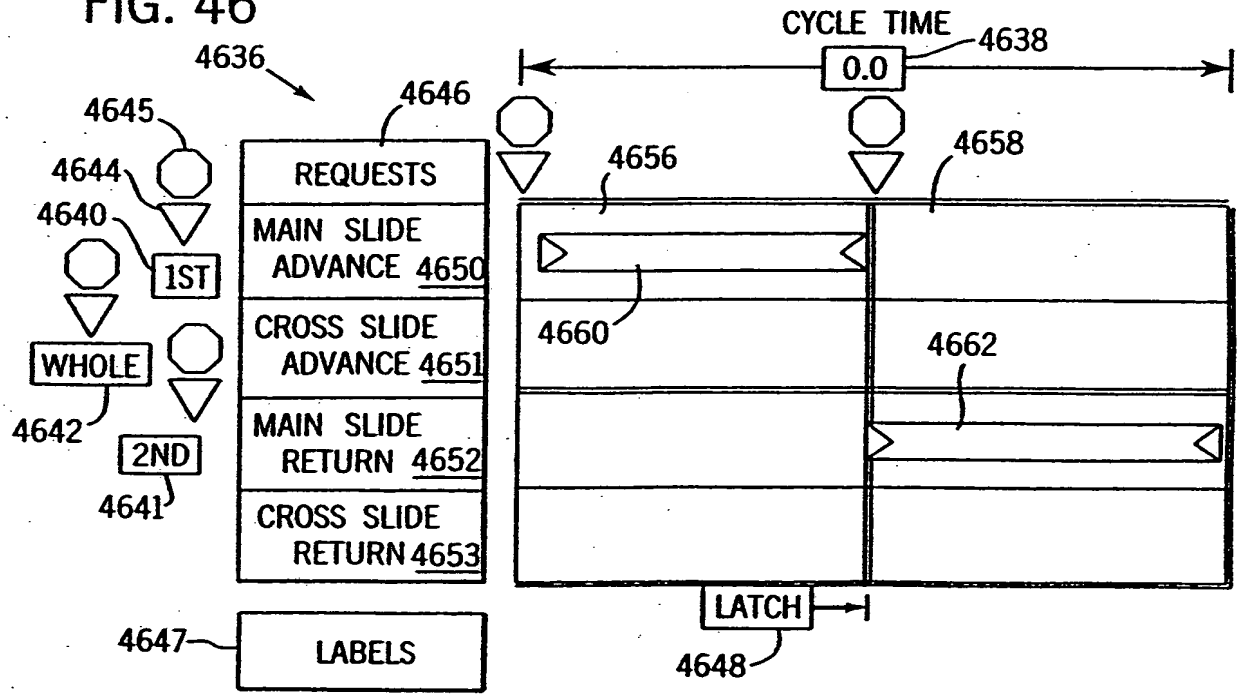
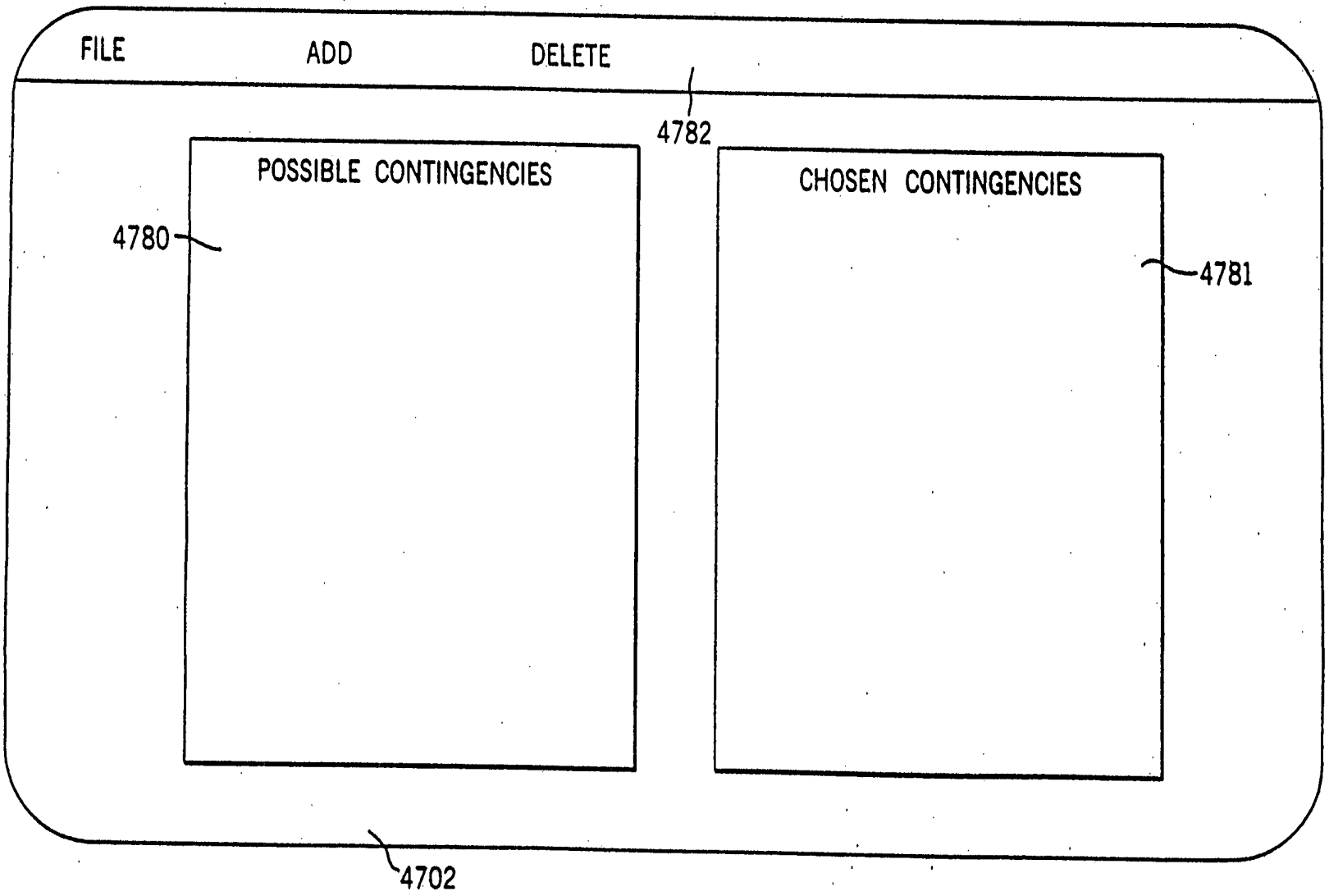

CYCLE TIME
4638
0.0
4636
4646
4645
4644
4640
1ST
WHOLE
4642
2ND
4641
REQUESTS
MAIN SLIDE ADVANCE 4650
CROSS SLIDE ADVANCE 4651
MAIN SLIDE RETURN 4652
CROSS SLIDE RETURN 4653
4647
LABELS
4656
4658
4660
4662
LATCH
4648

FIG. 47


FILE
ADD
DELETE
4782
POSSIBLE CONTINGENCIES
4780
CHOSEN CONTINGENCIES
4781
4702

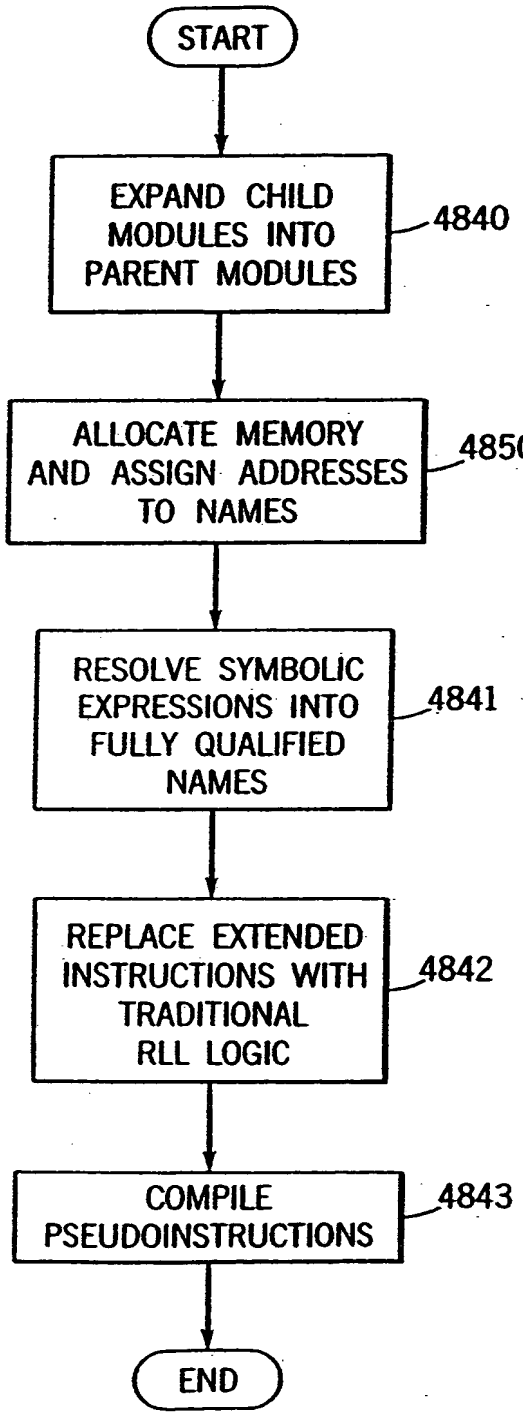

START
EXPAND CHILD MODULES INTO PARENT MODULES
4840
ALLOCATE MEMORY AND ASSIGN ADDRESSES TO NAMES
4850
RESOLVE SYMBOLIC EXPRESSIONS INTO FULLY QUALIFIED NAMES
4841
REPLACE EXTENDED INSTRUCTIONS WITH TRADITIONAL RLL LOGIC
4842
COMPILE PSEUDOINSTRUCTIONS
4843
END

FIG. 48

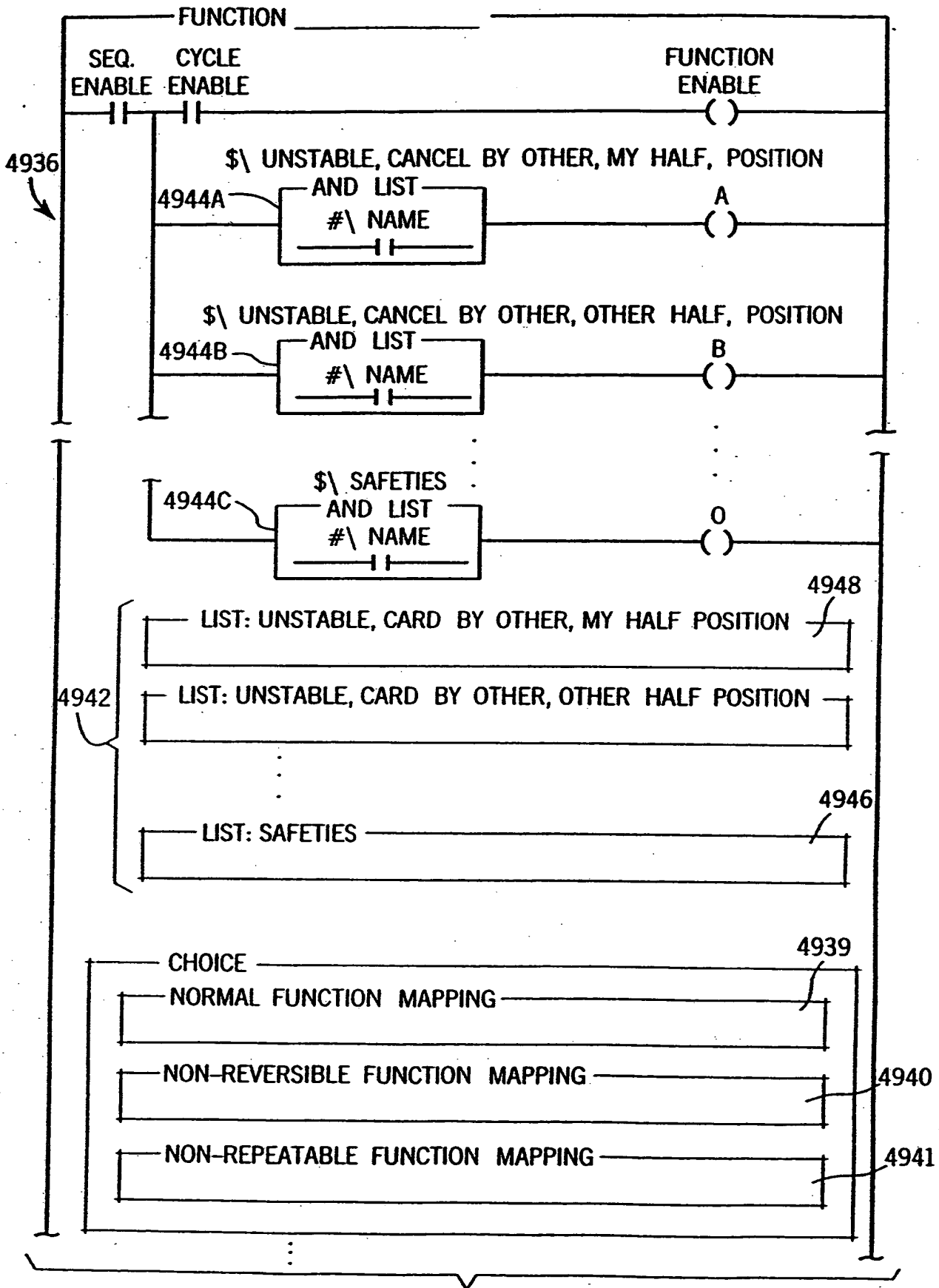

FUNCTION
SEQ. ENABLE
CYCLE ENABLE
FUNCTION ENABLE
4936
$\ UNSTABLE, CANCEL BY OTHER, MY HALF, POSITION
4944A
AND LIST
#\ NAME
A
$\ UNSTABLE, CANCEL BY OTHER, OTHER HALF, POSITION
4944B
AND LIST
#\ NAME
B
4944C
$\ SAFETIES
AND LIST
#\ NAME
O
4948
LIST: UNSTABLE, CARD BY OTHER, MY HALF POSITION
4942
LIST: UNSTABLE, CARD BY OTHER, OTHER HALF POSITION
4946
LIST: SAFETIES
4939
CHOICE
NORMAL FUNCTION MAPPING
NON-REVERSIBLE FUNCTION MAPPING
4940
NON-REPEATABLE FUNCTION MAPPING
4941

FIG. 49A

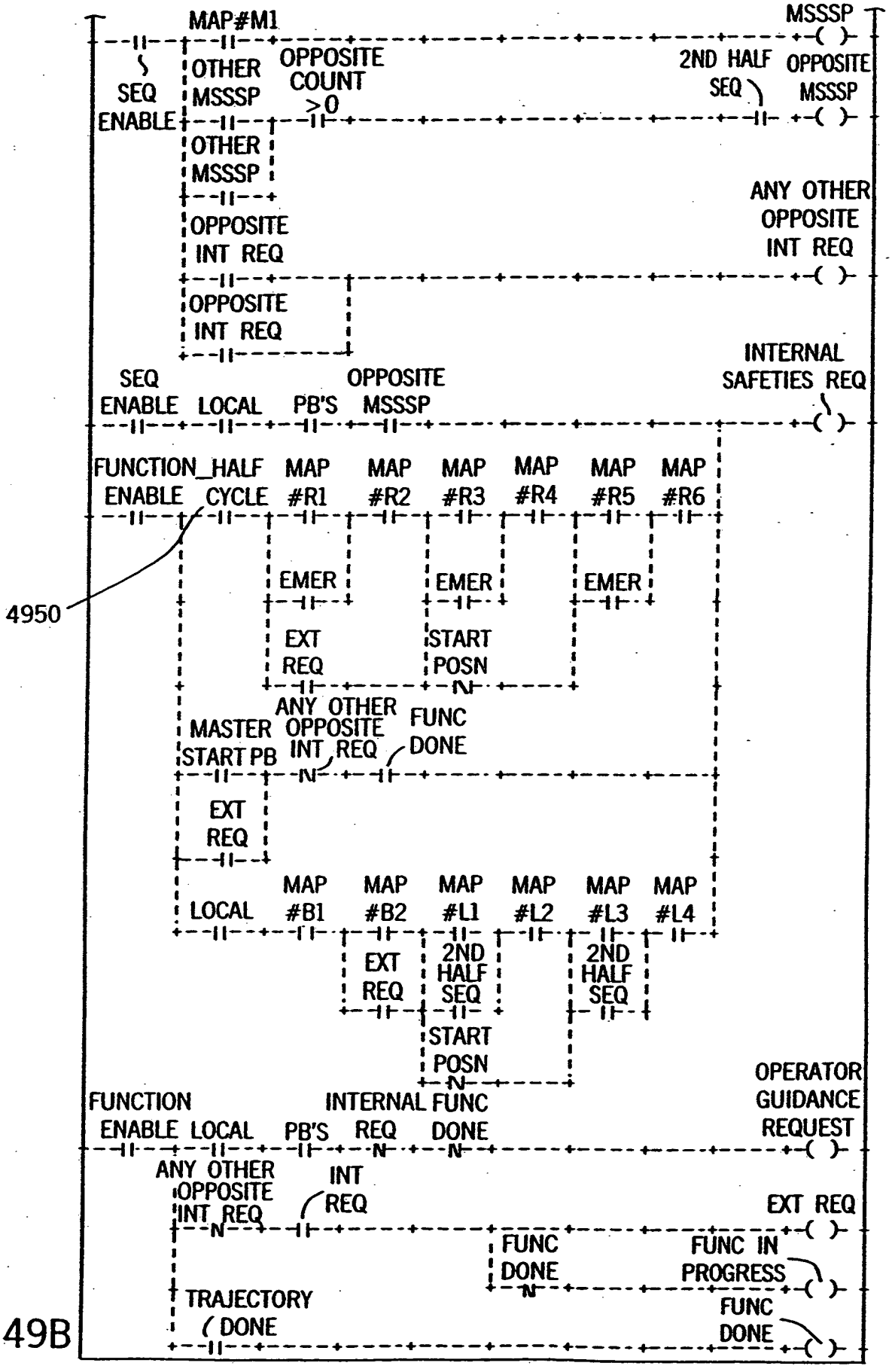

MAP#M1
MSSSP
SEQ ENABLE
OTHER MSSSP
OPPOSITE COUNT >0
2ND HALF SEQ
OPPOSITE MSSSP
OTHER MSSSP
OPPOSITE INT REQ
ANY OTHER OPPOSITE INT REQ
OPPOSITE INT REQ
SEQ ENABLE
LOCAL PB'S
OPPOSITE MSSSP
INTERNAL SAFETIES REQ
FUNCTION_HALF CYCLE ENABLE
MAP #R1
MAP #R2
MAP #R3
MAP #R4
MAP #R5
MAP #R6
4950
EMER
EMER
EMER
EXT REQ
START POSN
ANY OTHER OPPOSITE INT REQ
MASTER START PB
FUNC DONE
EXT REQ
LOCAL
MAP #B1
MAP #B2
MAP #L1
MAP #L2
MAP #L3
MAP #L4
EXT REQ
2ND HALF SEQ
2ND HALF SEQ
START POSN
FUNCTION ENABLE
LOCAL PB'S
INTERNAL REQ
FUNC DONE
OPERATOR GUIDANCE REQUEST
ANY OTHER OPPOSITE INT REQ
INT REQ
EXT REQ
FUNC DONE
FUNC IN PROGRESS
TRAJECTORY DONE
FUNC DONE

FIG. 49B

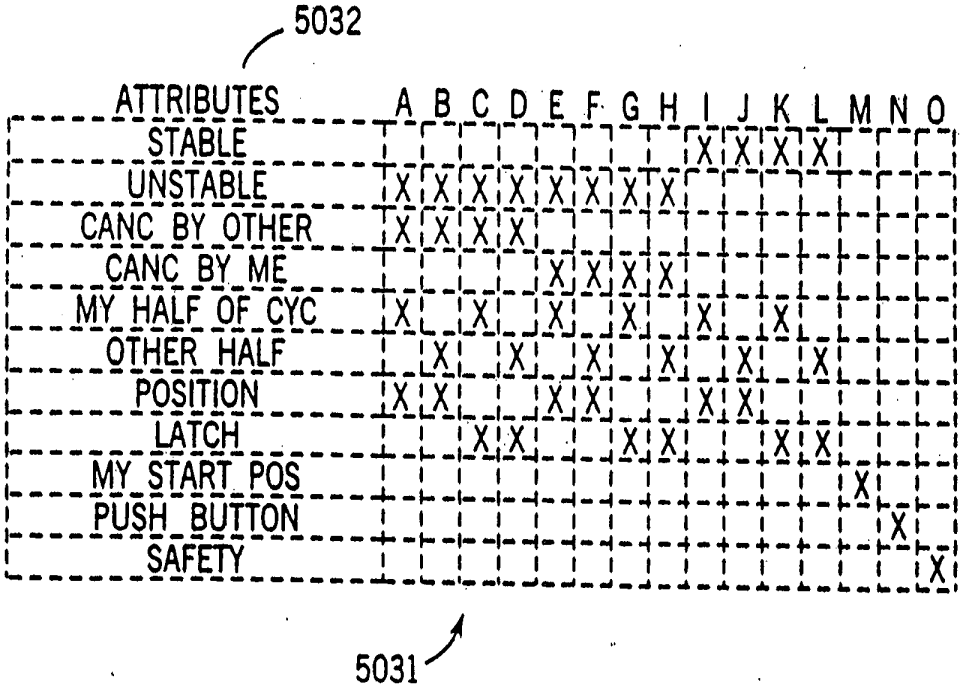
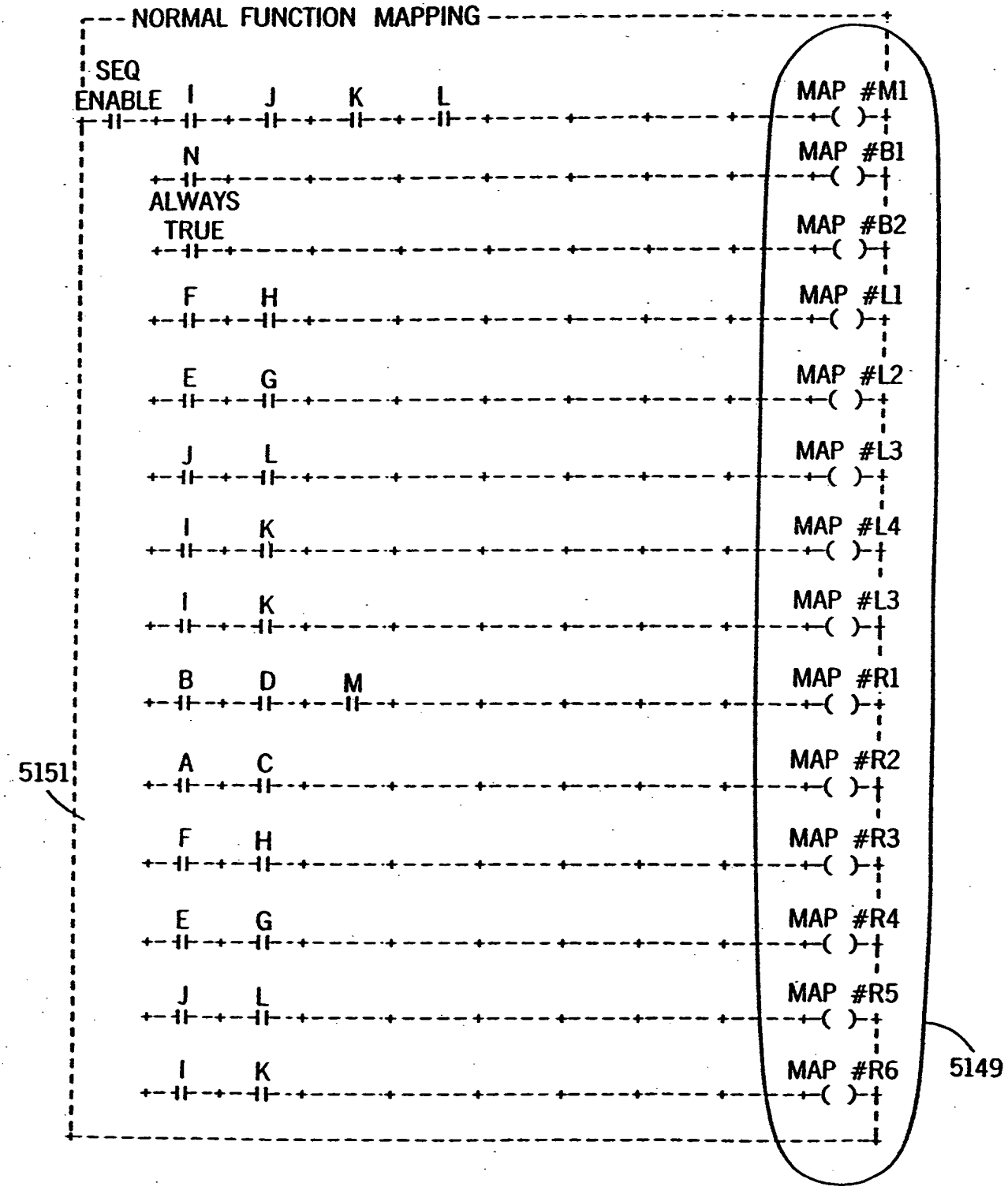

5032
ATTRIBUTES
A B C D E F G H I J K L M N O
STABLE
UNSTABLE
CANC BY OTHER
CANC BY ME
MY HALF OF CYC
OTHER HALF
POSITION
LATCH
MY START POS
PUSH BUTTON
SAFETY
5031

FIG. 50

FIG. 51


NORMAL FUNCTION MAPPING
SEQ ENABLE
I
J
K
L
MAP #M1
N
MAP #B1
ALWAYS TRUE
MAP #B2
F
H
MAP #L1
E
G
MAP #L2
J
L
MAP #L3
I
K
MAP #L4
I
K
MAP #L3
B
D
M
MAP #R1
A
C
MAP #R2
F
H
MAP #R3
E
G
MAP #R4
J
L
MAP #R5
I
K
MAP #R6
5151
5149

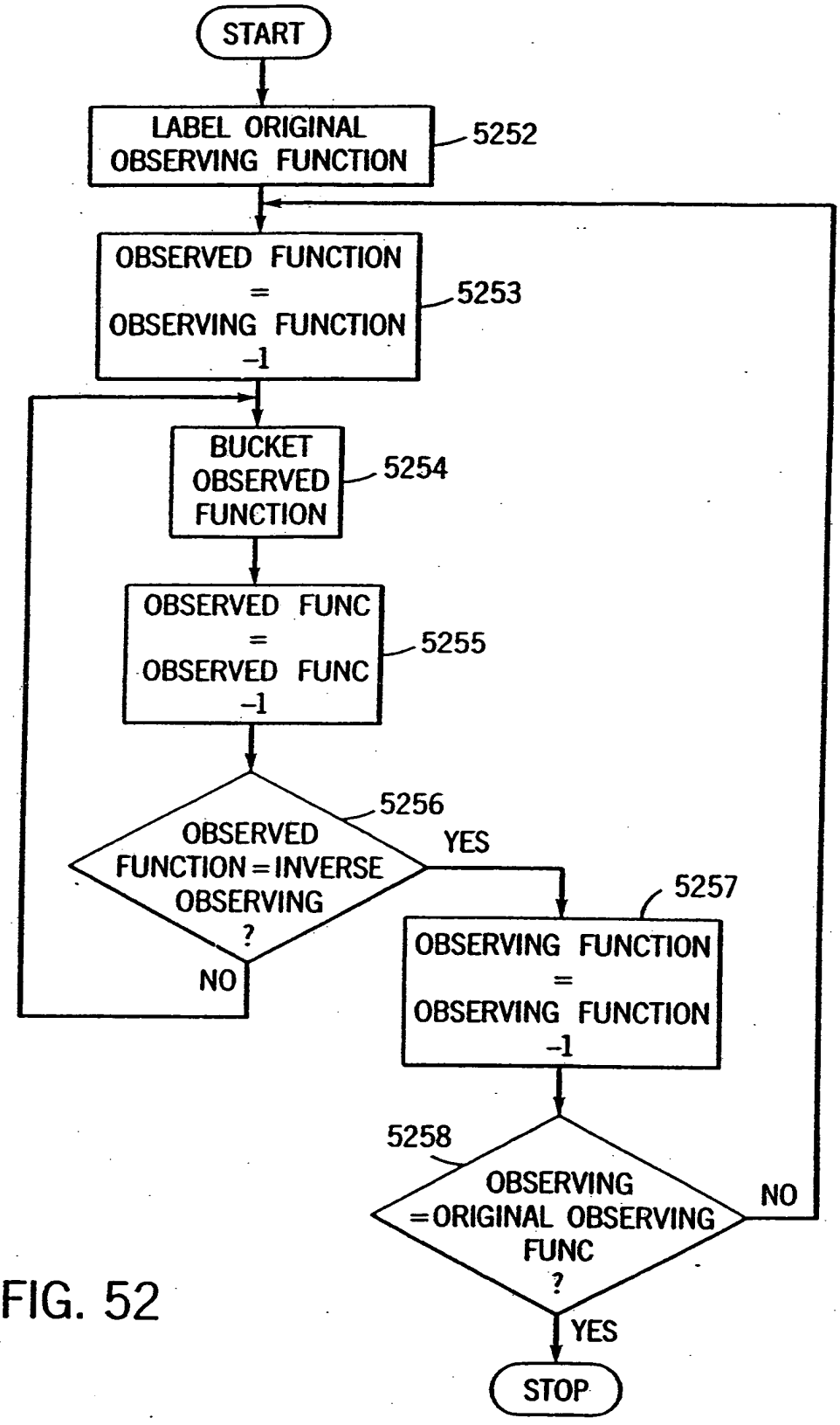
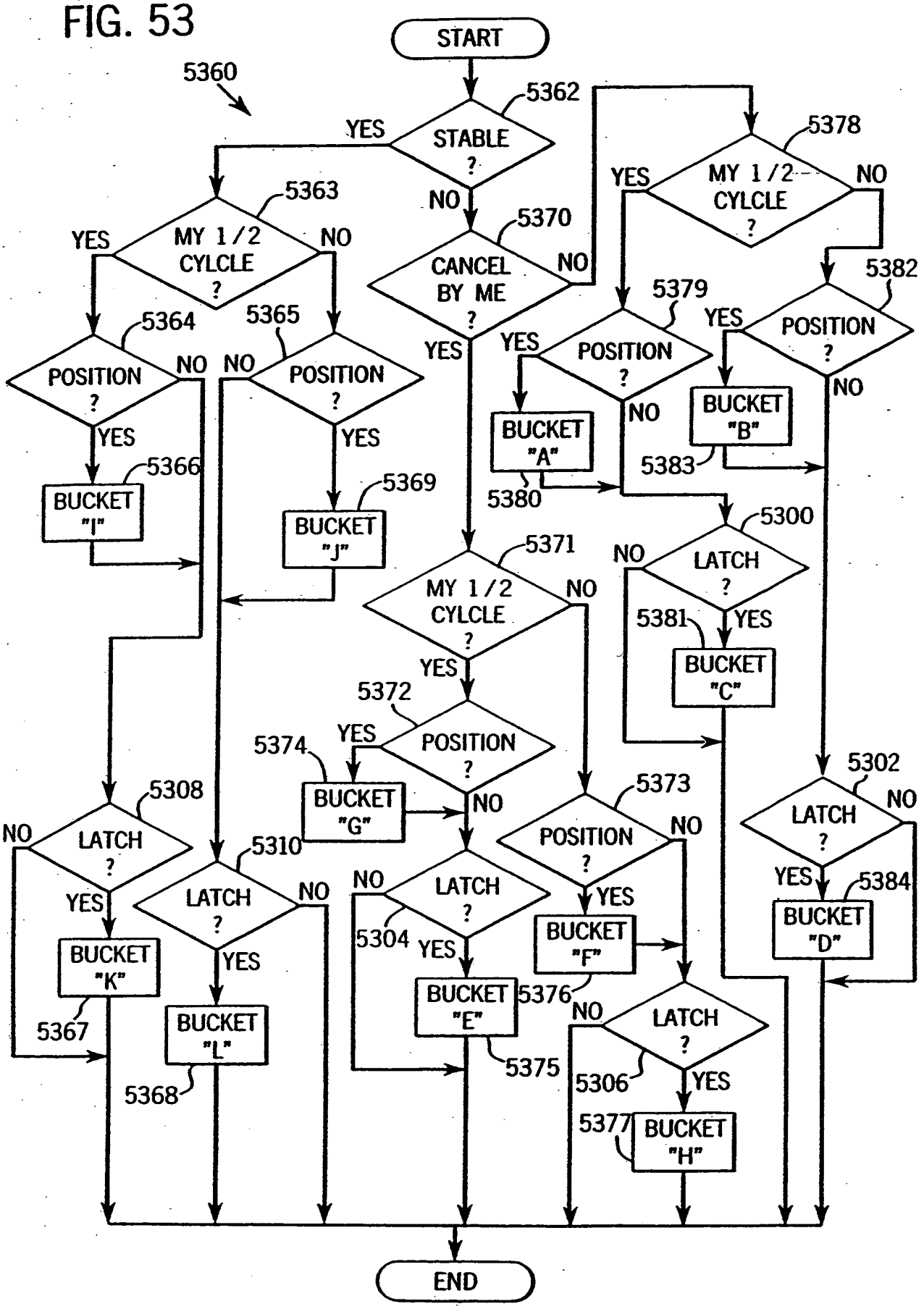

START
LABEL ORIGINAL OBSERVING FUNCTION
5252
OBSERVED FUNCTION = OBSERVING FUNCTION -1
5253
BUCKET OBSERVED FUNCTION
5254
OBSERVED FUNC = OBSERVED FUNC -1
5255
OBSERVED FUNCTION = INVERSE OBSERVING ?
5256
YES
NO
OBSERVING FUNCTION = OBSERVING FUNCTION -1
5257
OBSERVING = ORIGINAL OBSERVING FUNC ?
5258
NO
YES
STOP

FIG. 52

FIG. 53


START
5360
5362
STABLE ?
YES
NO
5363
MY 1/2 CYLCLE ?
YES
NO
5364
POSITION ?
NO
YES
5366
BUCKET "I"
5365
POSITION ?
NO
YES
5369
BUCKET "J"
5370
CANCEL BY ME ?
NO
YES
5371
MY 1/2 CYLCLE ?
NO
YES
5372
POSITION ?
YES
5374
BUCKET "G"
NO
5373
POSITION ?
NO
YES
BUCKET "F"
5376
5378
MY 1/2 CYLCLE ?
YES
NO
5379
POSITION ?
YES
NO
BUCKET "A"
5380
5382
POSITION ?
YES
NO
BUCKET "B"
5383
5300
LATCH ?
NO
5381
YES
BUCKET "C"
5302
LATCH ?
NO
YES
5384
BUCKET "D"
5308
LATCH ?
NO
YES
BUCKET "K"
5367
5310
LATCH ?
NO
YES
BUCKET "L"
5368
LATCH ?
NO
5304
YES
BUCKET "E"
5375
LATCH ?
NO
5306
YES
5377
BUCKET "H"
END

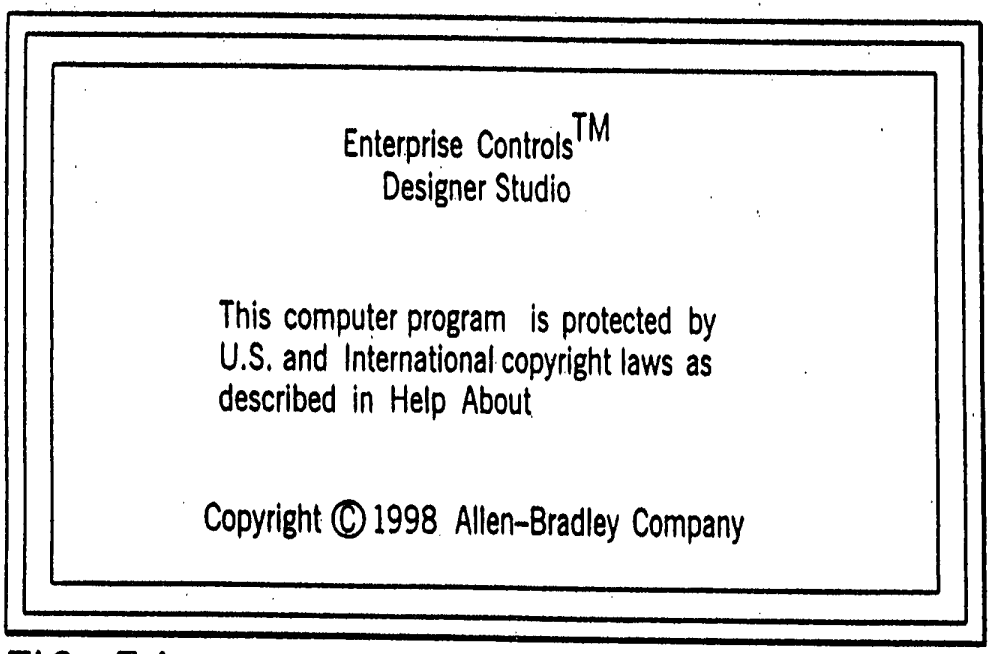

Enterprise Controls™
Designer Studio
This computer program is protected by U.S. and International copyright laws as described in Help About
Copyright © 1998 Allen-Bradley Company

FIG. 54

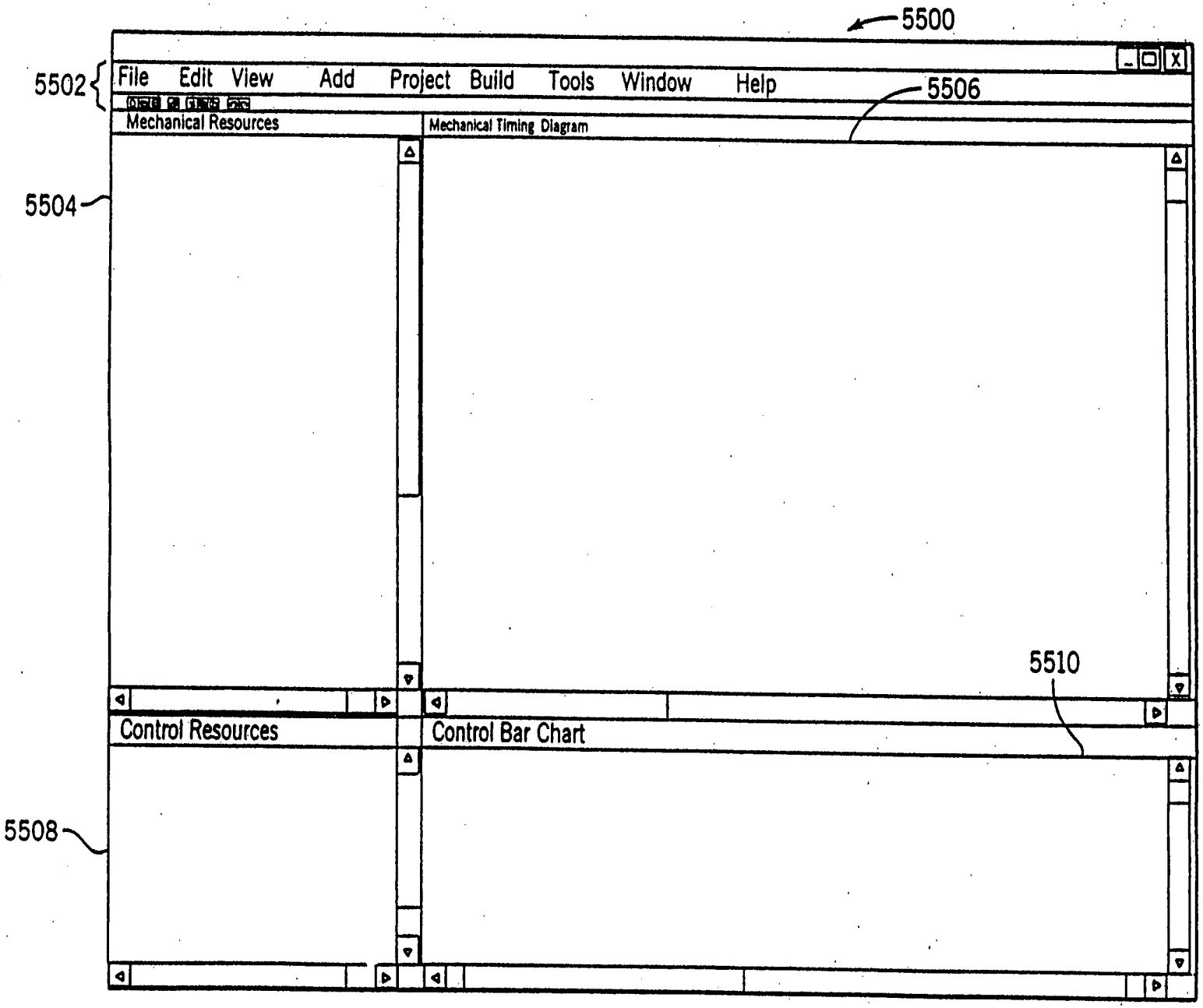

5500
5502
File Edit View Add Project Build Tools Window Help
5506
Mechanical Resources
Mechanical Timing Diagram
5504
5510
Control Resources
Control Bar Chart
5508

FIG. 55

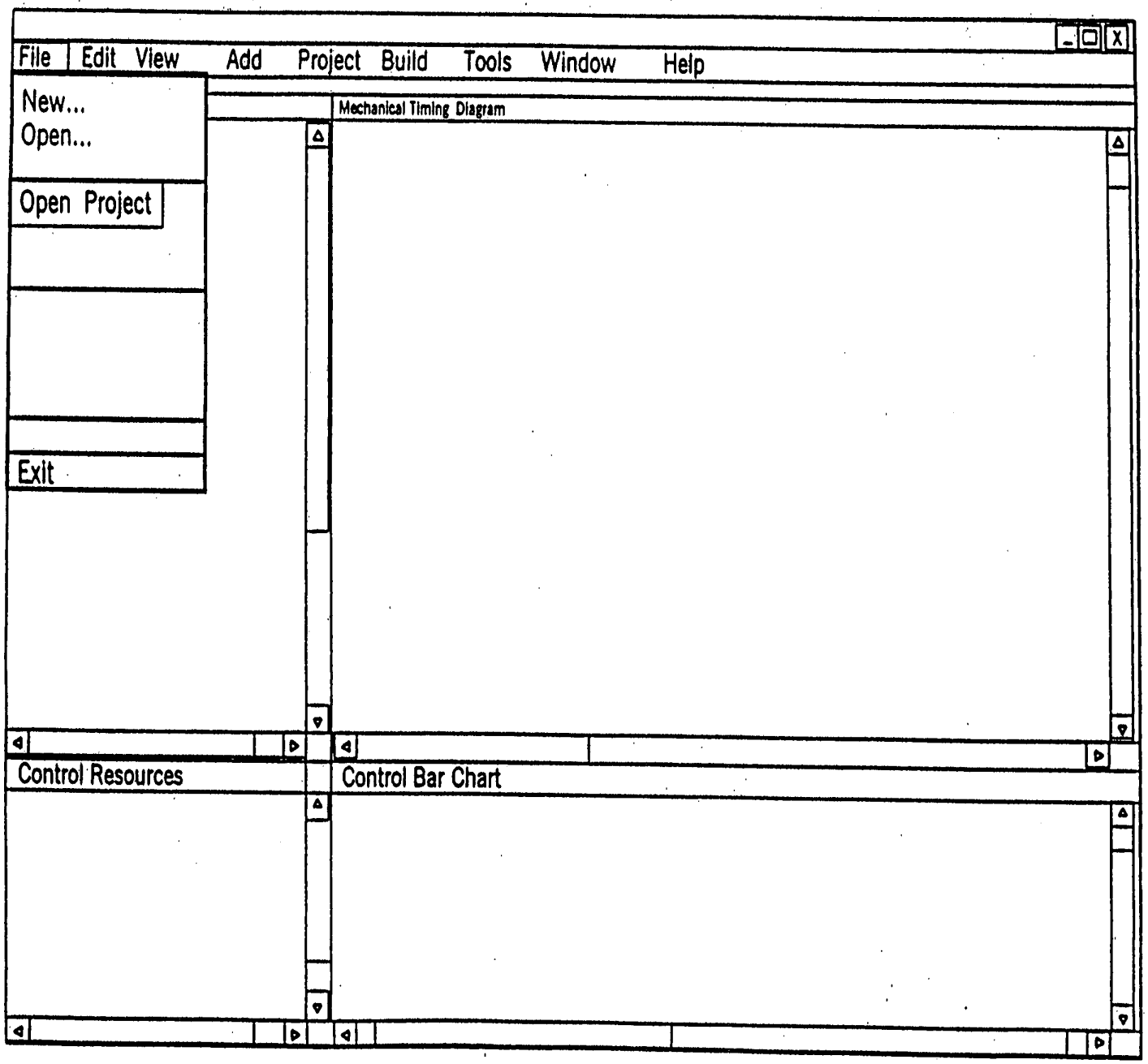

File
Edit
View
Add
Project
Build
Tools
Window
Help
New...
Open...
Open Project
Exit
Mechanical Timing Diagram
Control Resources
Control Bar Chart

FIG. 56

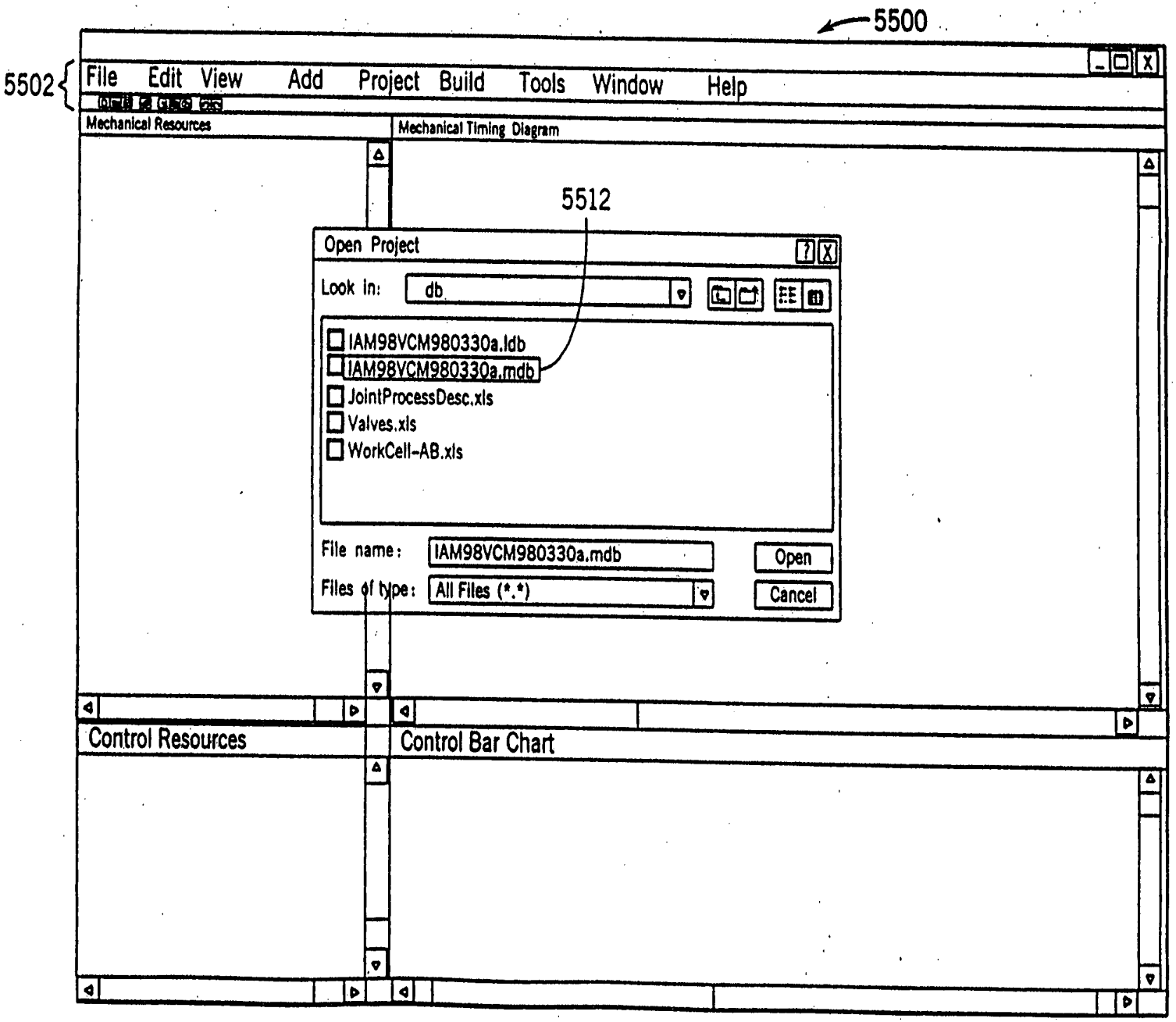

5500
5502
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
5512
Open Project
Look in: db
IAM98VCM980330a.ldb
IAM98VCM980330a.mdb
JointProcessDesc.xls
Valves.xls
WorkCell-AB.xls
File name: IAM98VCM980330a.mdb
Open
Files of type: All Files (*.*)
Cancel
Control Resources
Control Bar Chart

FIG. 57

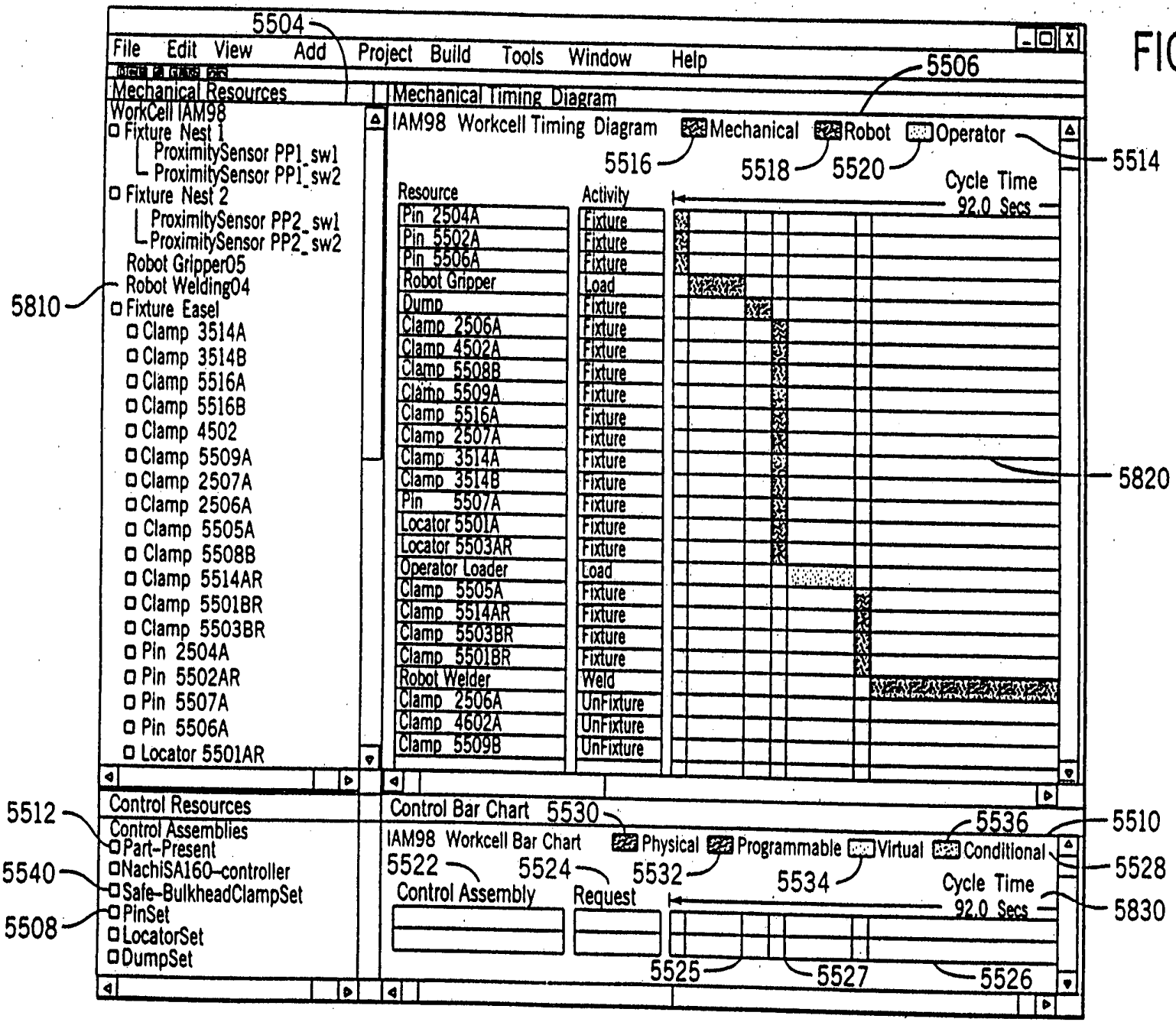

5504
File Edit View Add Project Build Tools Window Help
5506
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Pin 2504A
Pin 5502AR
Pin 5507A
Pin 5506A
Locator 5501AR
5810
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
5516
5518
5520
5514
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A Fixture
Pin 5502A Fixture
Pin 5506A Fixture
Robot Gripper Load
Dump Fixture
Clamp 2506A Fixture
Clamp 4502A Fixture
Clamp 5508B Fixture
Clamp 5509A Fixture
Clamp 5516A Fixture
Clamp 2507A Fixture
Clamp 3514A Fixture
Clamp 3514B Fixture
Pin 5507A Fixture
Locator 5501A Fixture
Locator 5503AR Fixture
Operator Loader Load
Clamp 5505A Fixture
Clamp 5514AR Fixture
Clamp 5503BR Fixture
Clamp 5501BR Fixture
Robot Welder Weld
Clamp 2506A UnFixture
Clamp 4602A UnFixture
Clamp 5509B UnFixture
5820
5512
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
5540
5508
Control Bar Chart 5530
5536
5510
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
5522
5524
5532
5534
5528
Control Assembly
Request
Cycle Time
92.0 Secs
5830
5525
5527
5526

FIG. 58

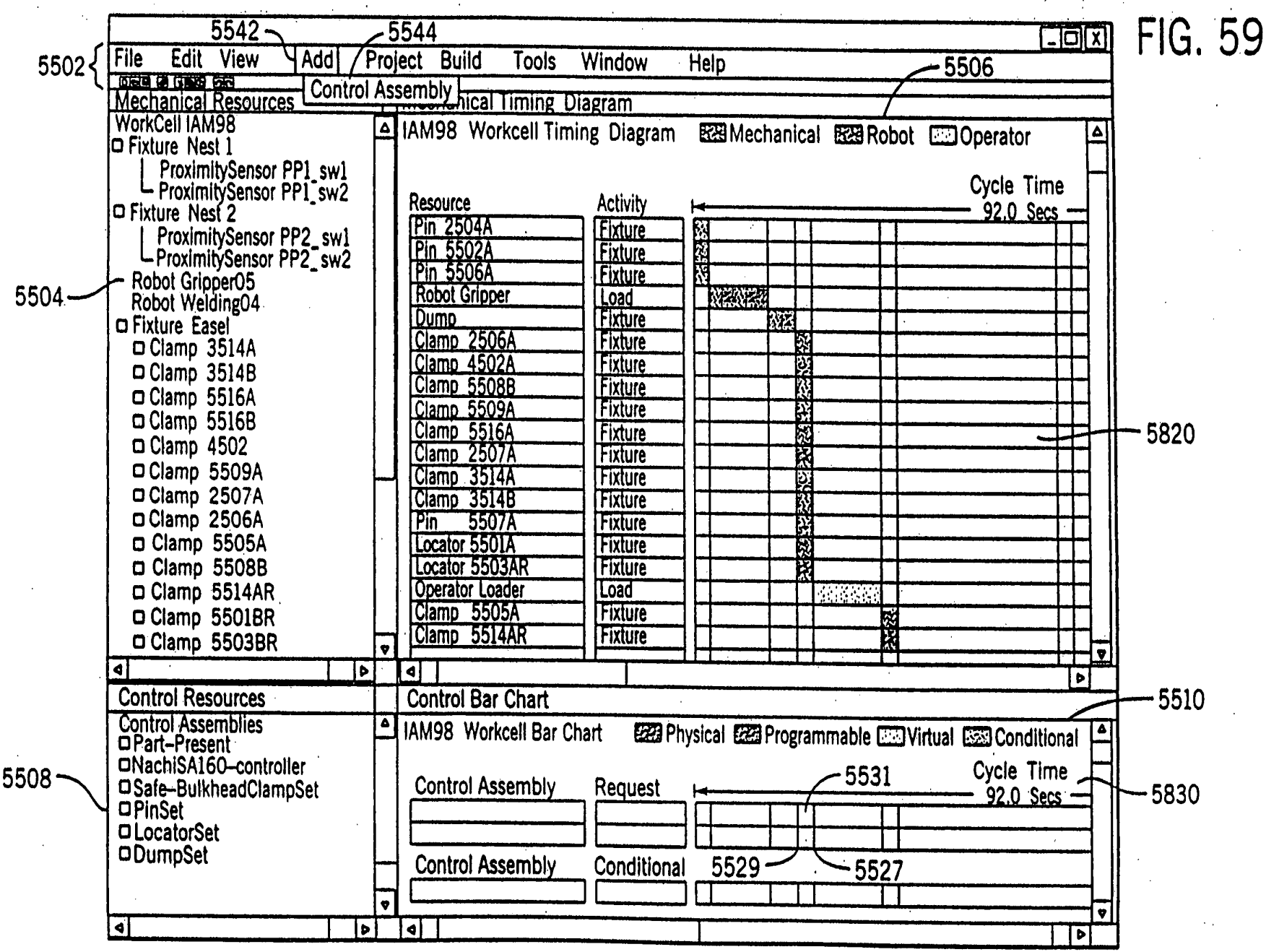
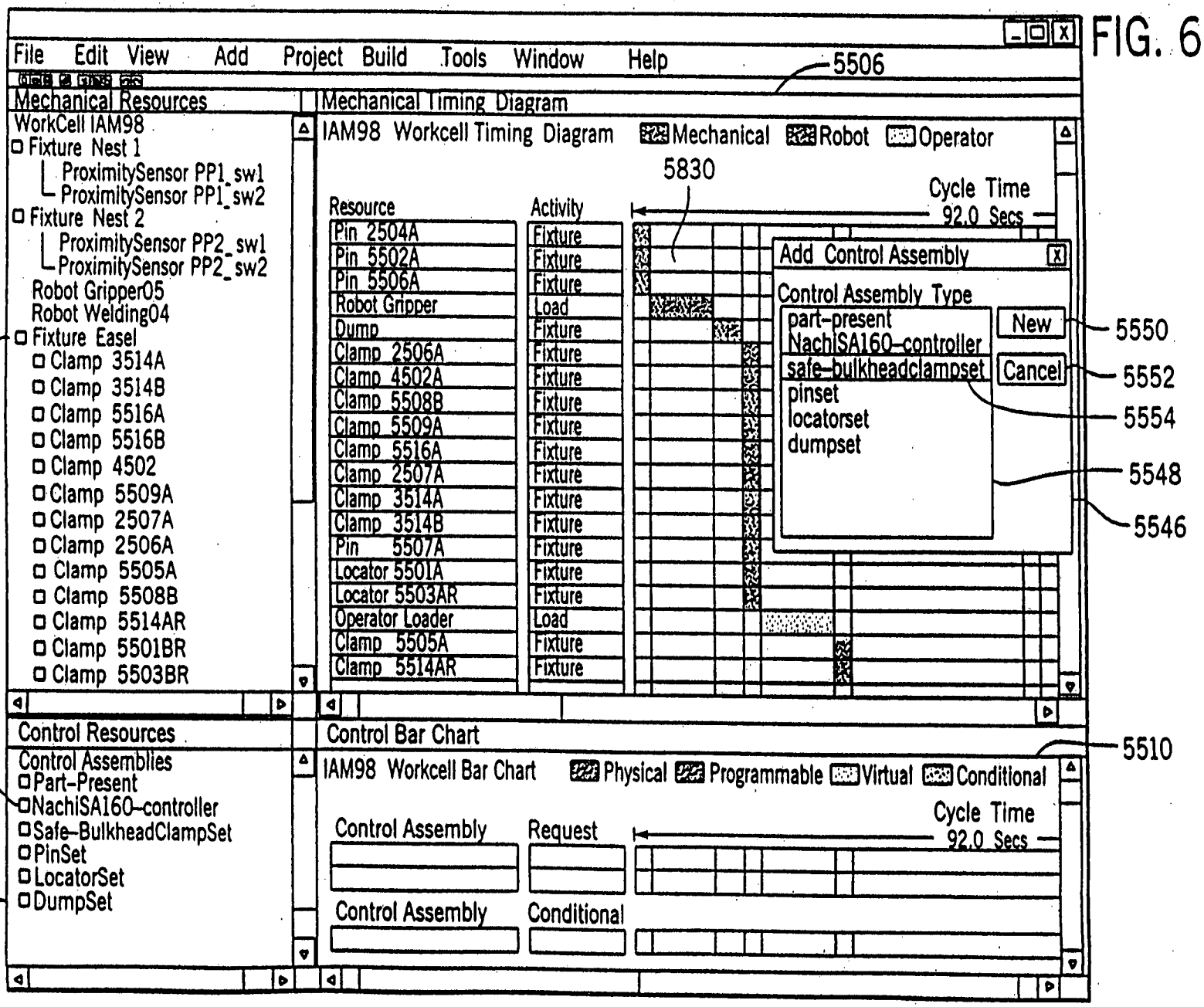

5542
5544
5502
File Edit View
Add
Project Build Tools Window Help
Control Assembly
5506
Mechanical Resources
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
5504
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Resource
Activity
Cycle Time
92.0 Secs
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
5820
Control Resources
Control Bar Chart
5510
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
5508
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
5531
Cycle Time
92.0 Secs
5830
Control Assembly
Conditional
5529
5527

FIG. 59

FIG. 60


File Edit View Add Project Build Tools Window Help
5506
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
5504
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
5830
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
5550
5552
5554
5548
5546
Control Resources
Control Bar Chart
5510
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
5512
5508
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
Cycle Time
92.0 Secs
Control Assembly
Conditional

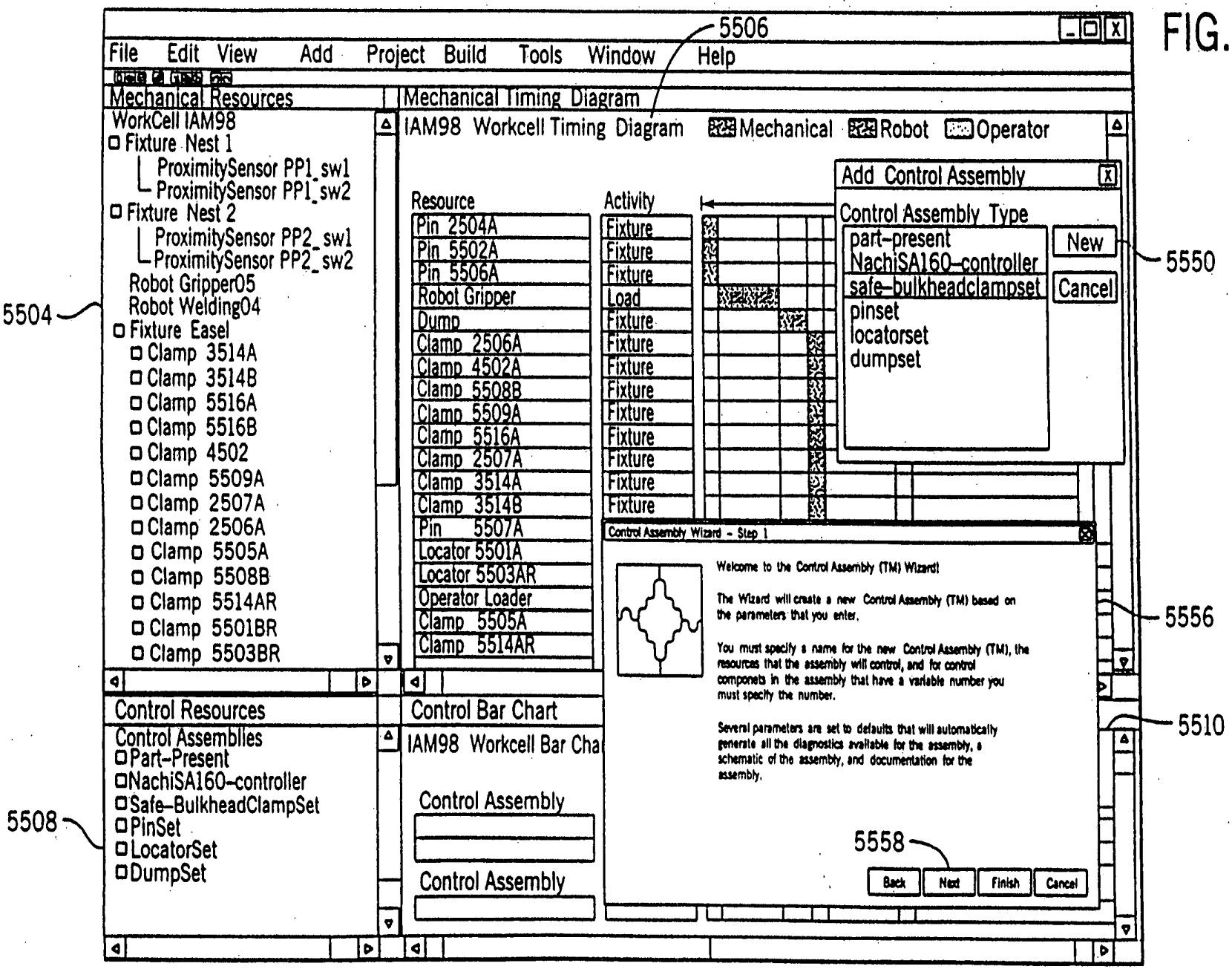

5506
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
5504
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
5550
Control Assembly Wizard - Step 1
Welcome to the Control Assembly (TM) Wizard!
The Wizard will create a new Control Assembly (TM) based on the parameters that you enter.
You must specify a name for the new Control Assembly (TM), the resources that the assembly will control, and for control componets in the assembly that have a variable number you must specify the number.
Several parameters are set to defaults that will automatically generate all the diagnostics available for the assembly, a schematic of the assembly, and documentation for the assembly.
5556
5510
5558
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
5508
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 61

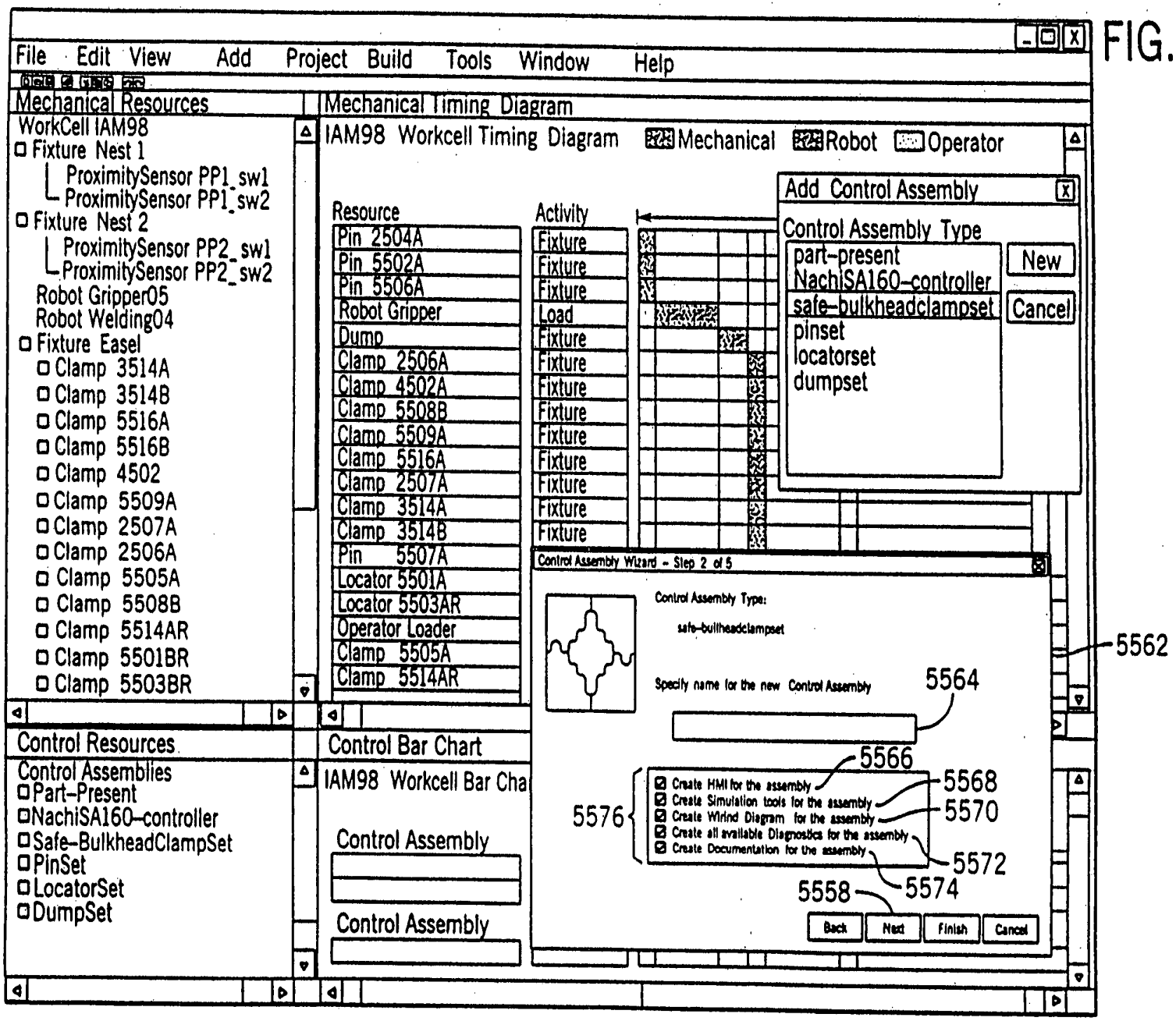

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 2 of 5
Control Assembly Type:
safe-bulkheadclampset
Specify name for the new Control Assembly
5562
5564
5566
5568
5570
5572
5574
5576
5558
Create HMI for the assembly
Create Simulation tools for the assembly
Create Wirlnd Diagram for the assembly
Create all available Diagnostics for the assembly
Create Documentation for the assembly
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 62

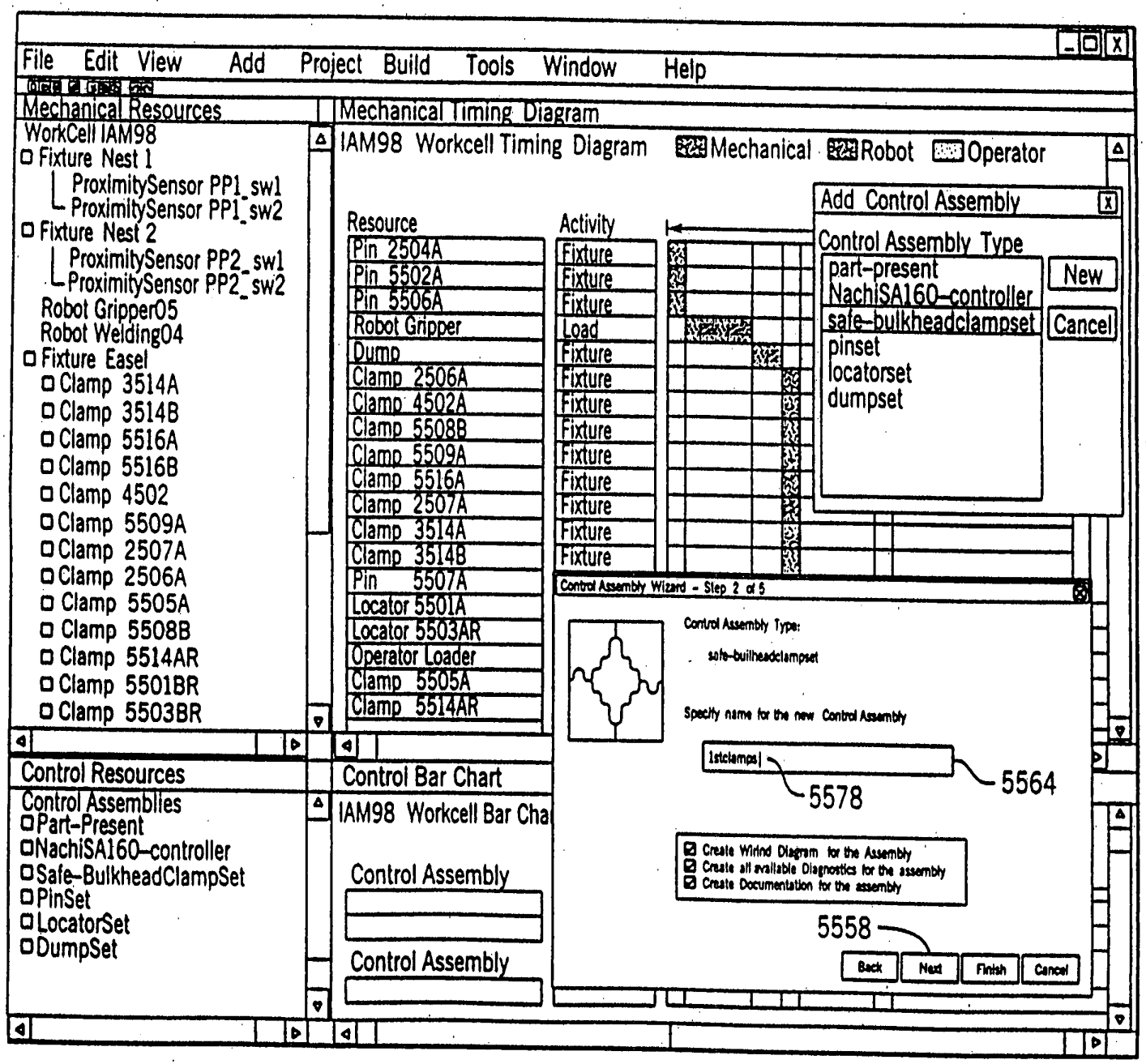

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 2 of 5
Control Assembly Type:
safe-builheadclampset
Specify name for the new Control Assembly
1stclamps
5578
5564
Create Wiring Diagram for the Assembly
Create all available Diagnostics for the assembly
Create Documentation for the assembly
5558
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 63

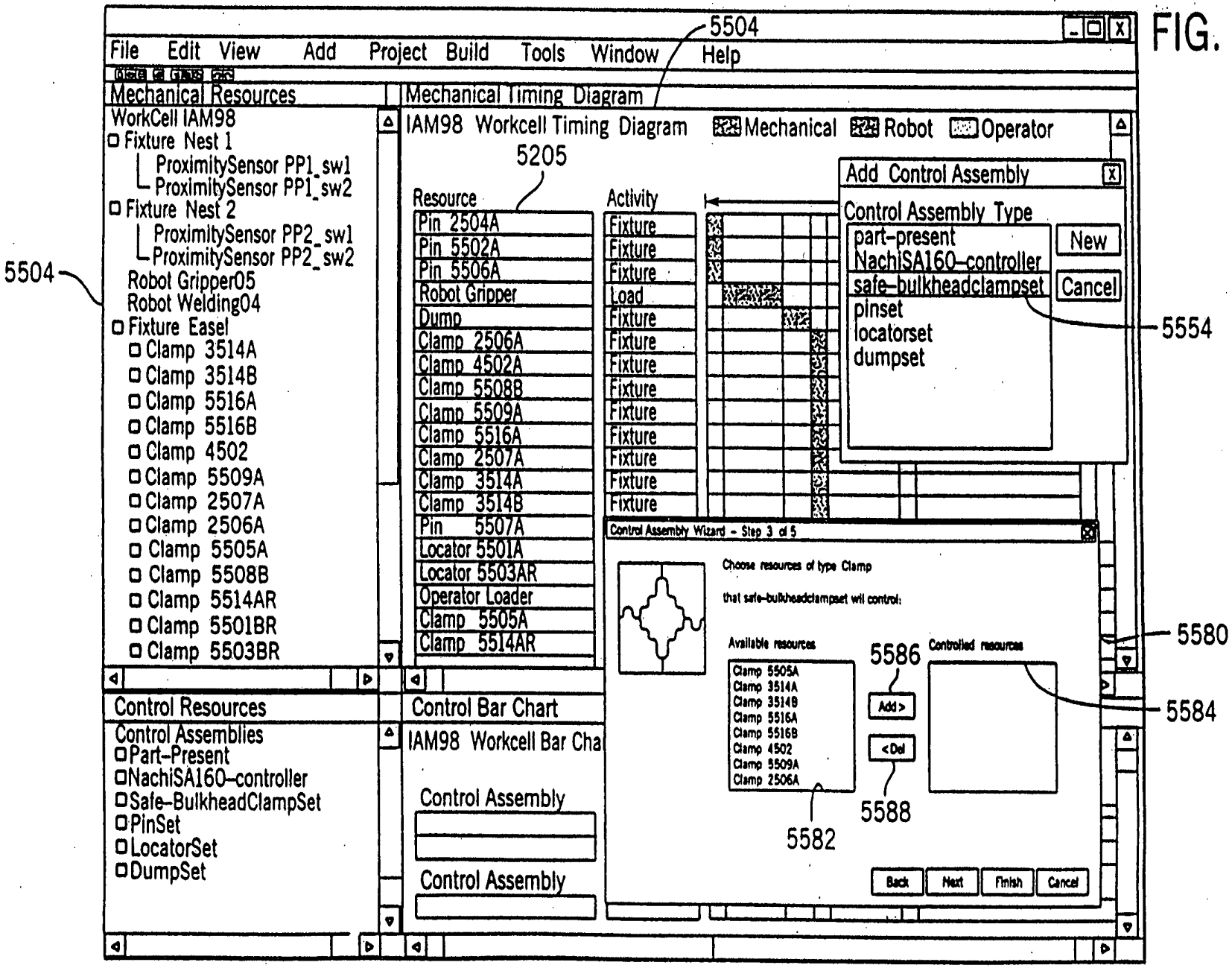

5504
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
5205
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
5554
Control Assembly Wizard - Step 3 of 5
Choose resources of type Clamp
that safe-bulkheadclampset will control:
Available resources
Clamp 5505A
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2506A
5586
Add>
<Del
5588
5582
Controlled resources
5580
5584
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 64

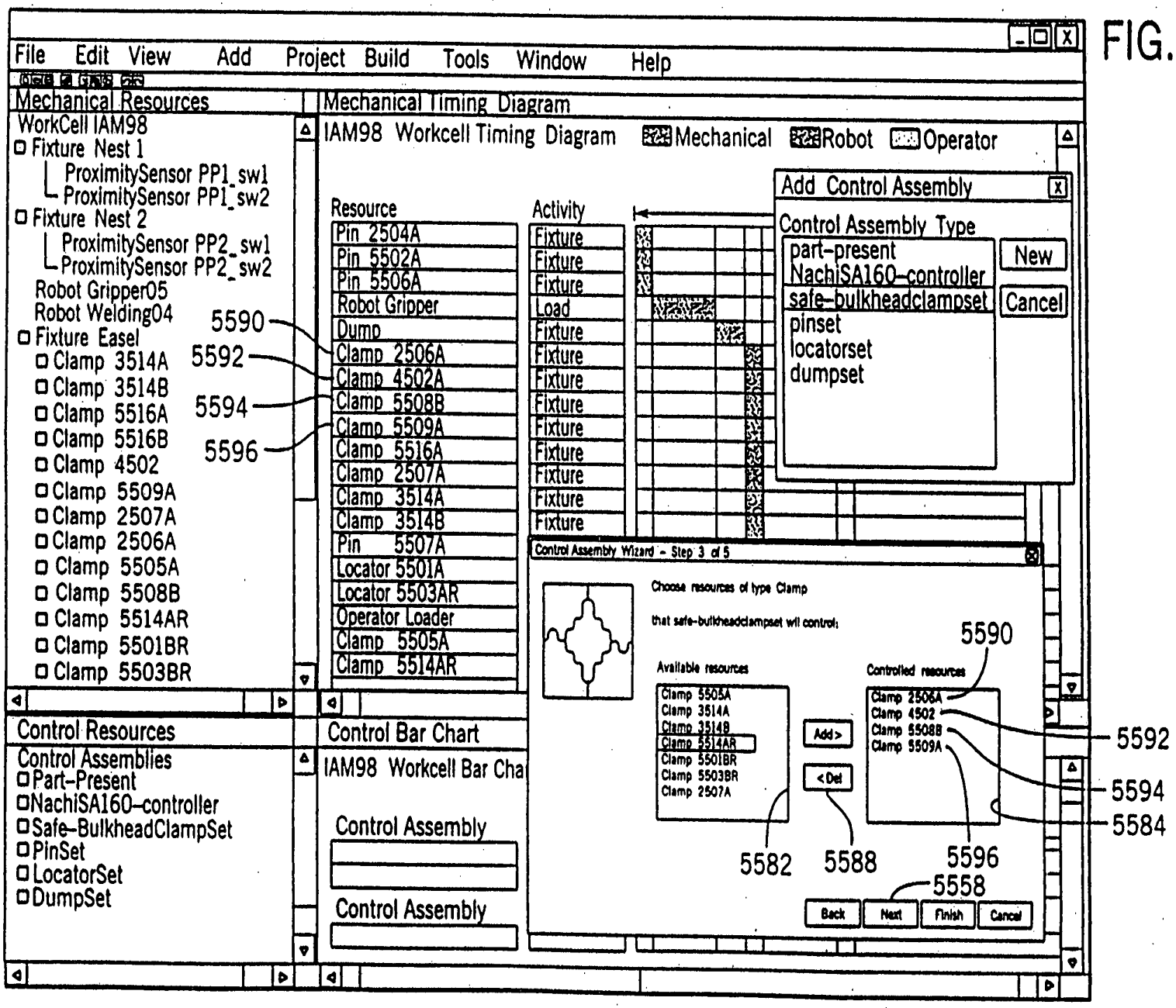

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
5590
5592
5594
5596
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 3 of 5
Choose resources of type Clamp
that safe-bulkheadclampset will control:
Available resources
Clamp 5505A
Clamp 3514A
Clamp 3514B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Clamp 2507A
Add>
<Del
Controlled resources
Clamp 2506A
Clamp 4502
Clamp 5508B
Clamp 5509A
5590
5592
5594
5584
5582
5588
5596
5558
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 65

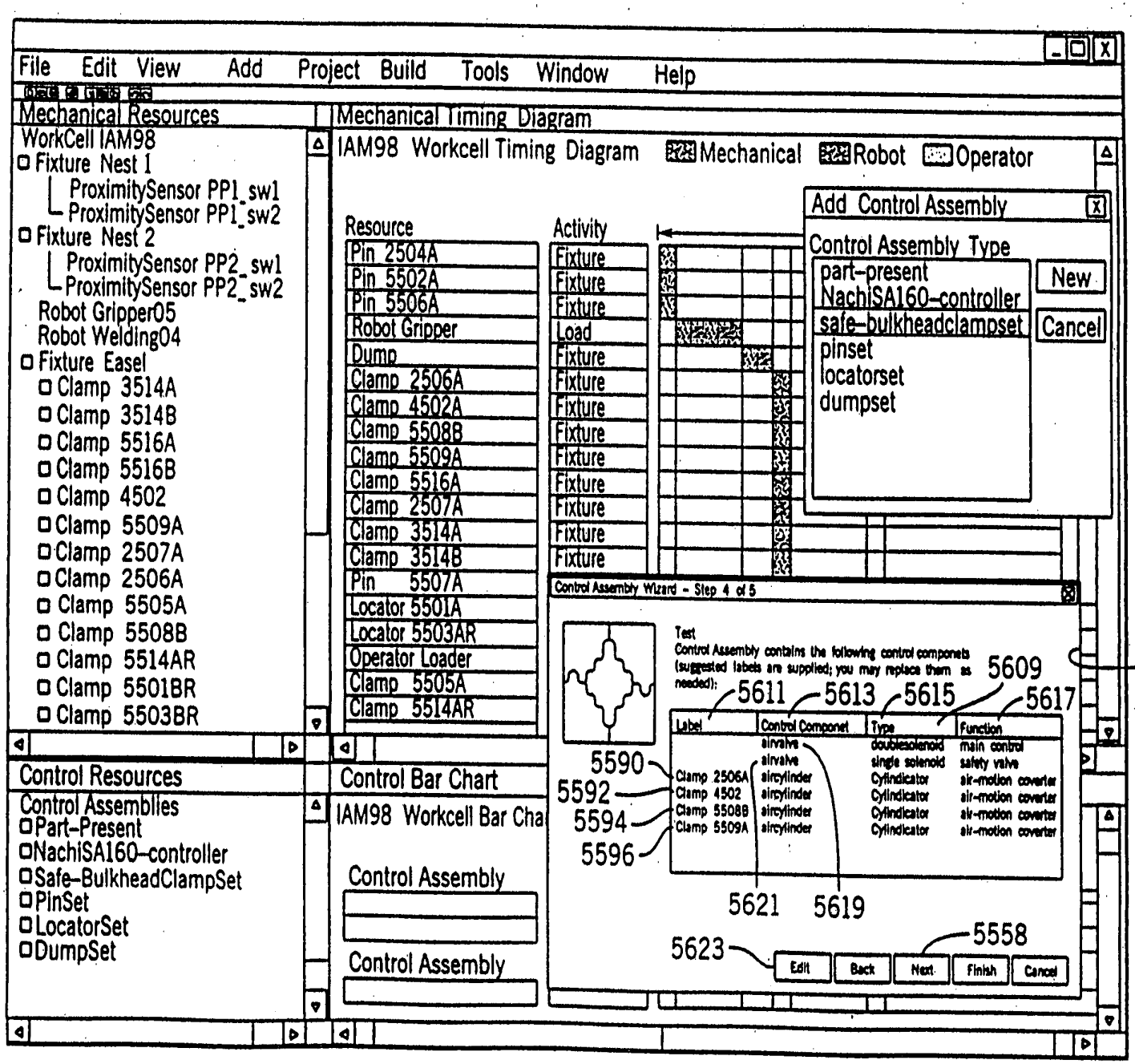

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 4 of 5
Test
Control Assembly contains the following control componets (suggested labels are supplied; you may replace them as needed):
5607
5609
5611
5613
5615
5617
Label
Control Componet
Type
Function
airvalve
doublesolenoid
main control
airvalve
single solenoid
safety valve
Clamp 2506A
aircylinder
Cylindicator
air-motion coverter
Clamp 4502
aircylinder
Cylindicator
air-motion coverter
Clamp 5508B
aircylinder
Cylindicator
air-motion coverter
Clamp 5509A
aircylinder
Cylindicator
air-motion coverter
5590
5592
5594
5596
5621
5619
5623
5558
Edit
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 66

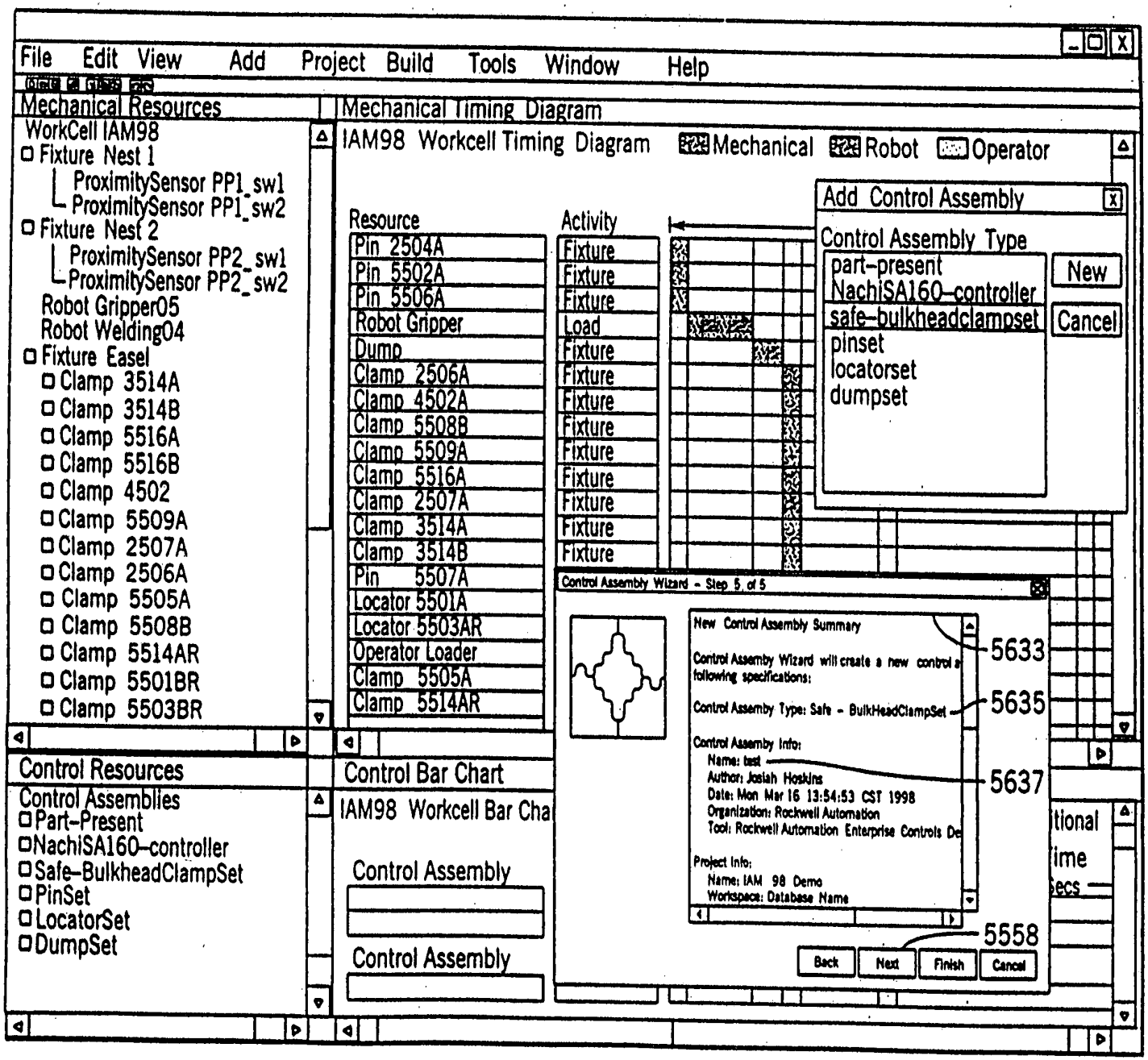

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 5 of 5
New Control Assembly Summary
Control Assembly Wizard will create a new control a
following specifications:
Control Assembly Type: Safe - BulkHeadClampSet
Control Assembly Info:
Name: test
Author: Josiah Hoskins
Date: Mon Mar 16 13:54:53 CST 1998
Organization: Rockwell Automation
Tool: Rockwell Automation Enterprise Controls De
Project Info:
Name: IAM 98 Demo
Workspace: Database Name
5633
5635
5637
5558
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 67

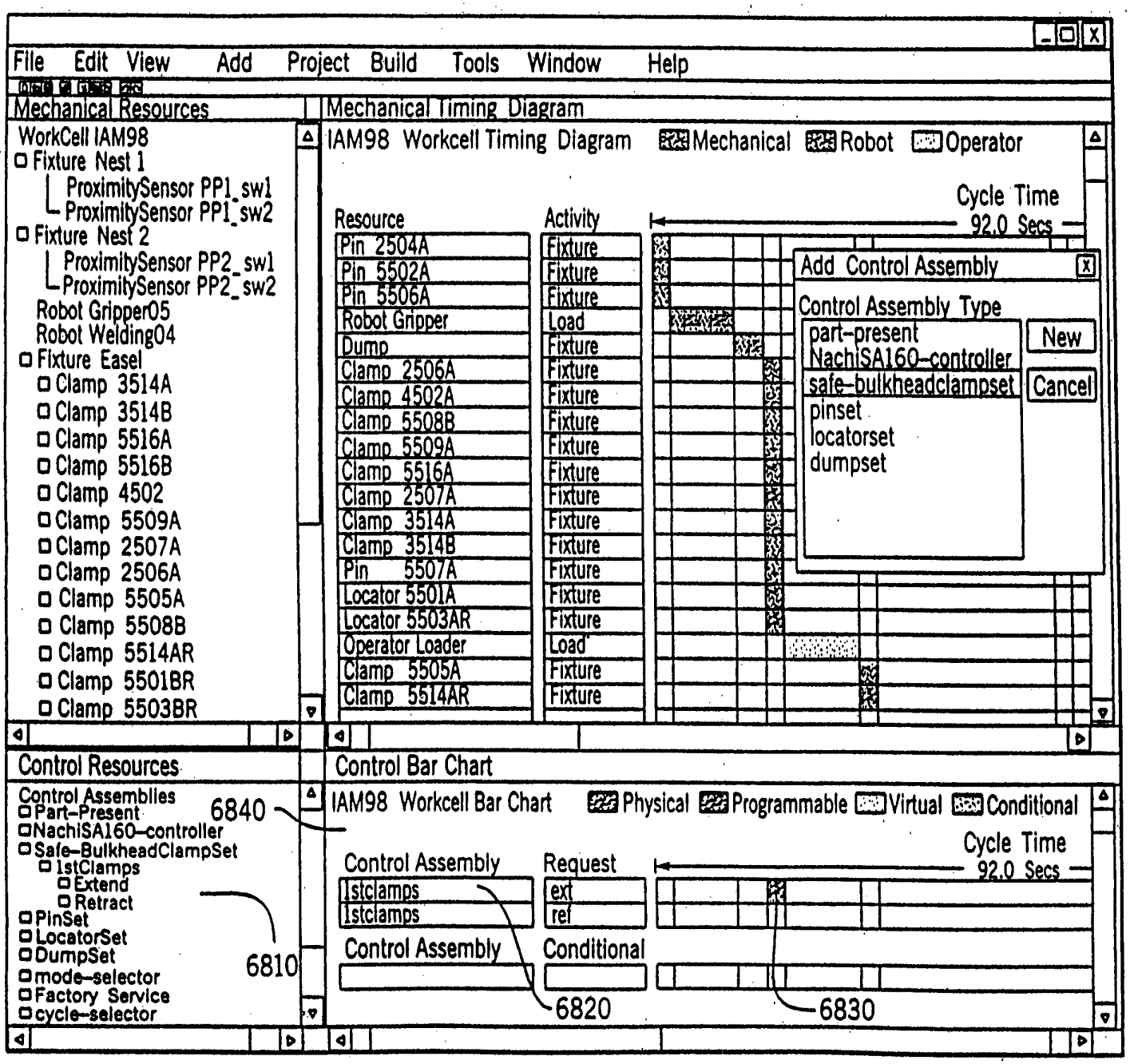

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
cycle-selector
6840
6810
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
1stclamps
1stclamps
ext
ref
Control Assembly
Conditional
6820
6830

FIG. 68

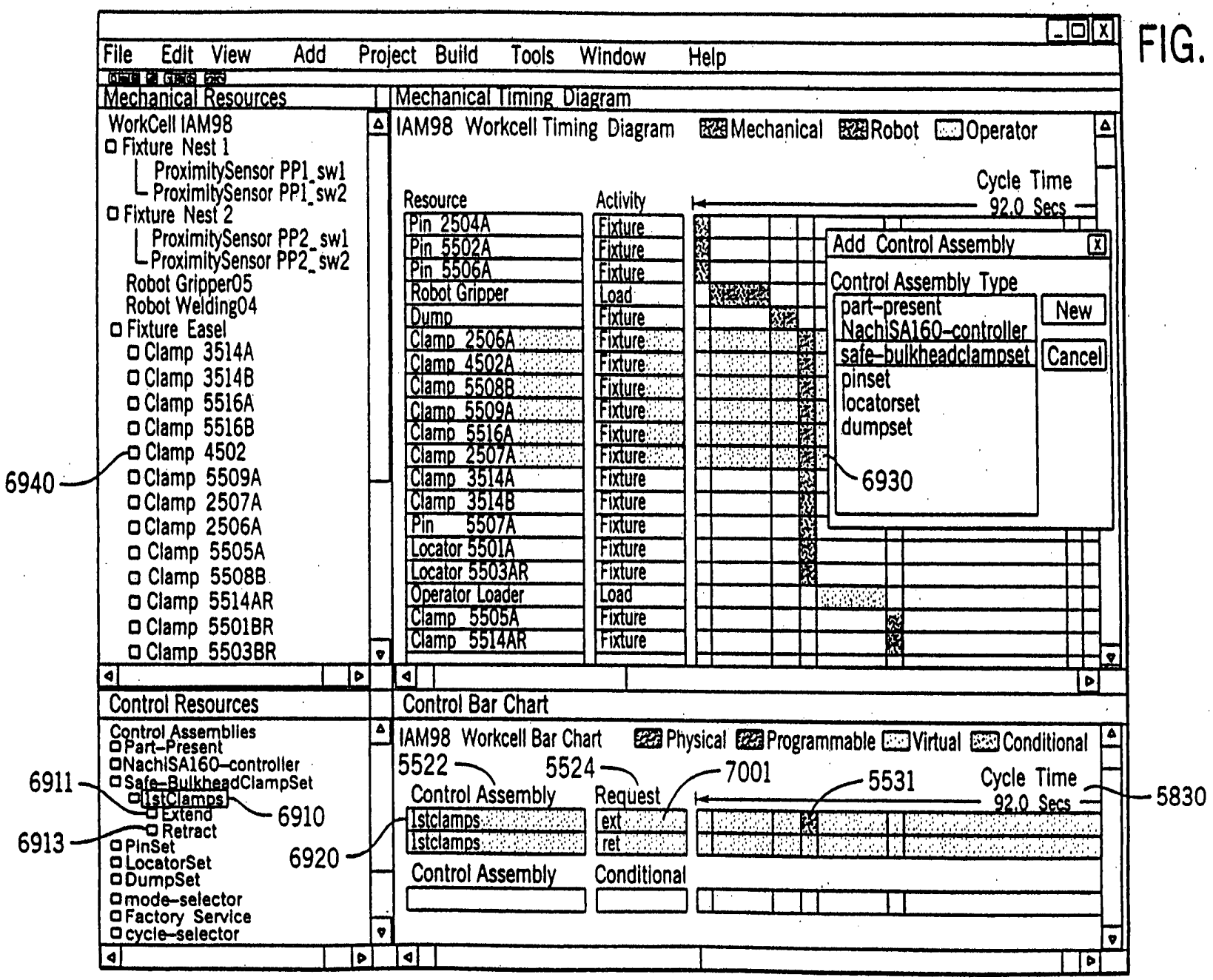

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
6940
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
6930
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
cycle-selector
6911
6910
6913
6920
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
5522
5524
7001
5531
Cycle Time
92.0 Secs
5830
Control Assembly
Request
1stclamps
ext
1stclamps
ret
Control Assembly
Conditional

FIG. 69

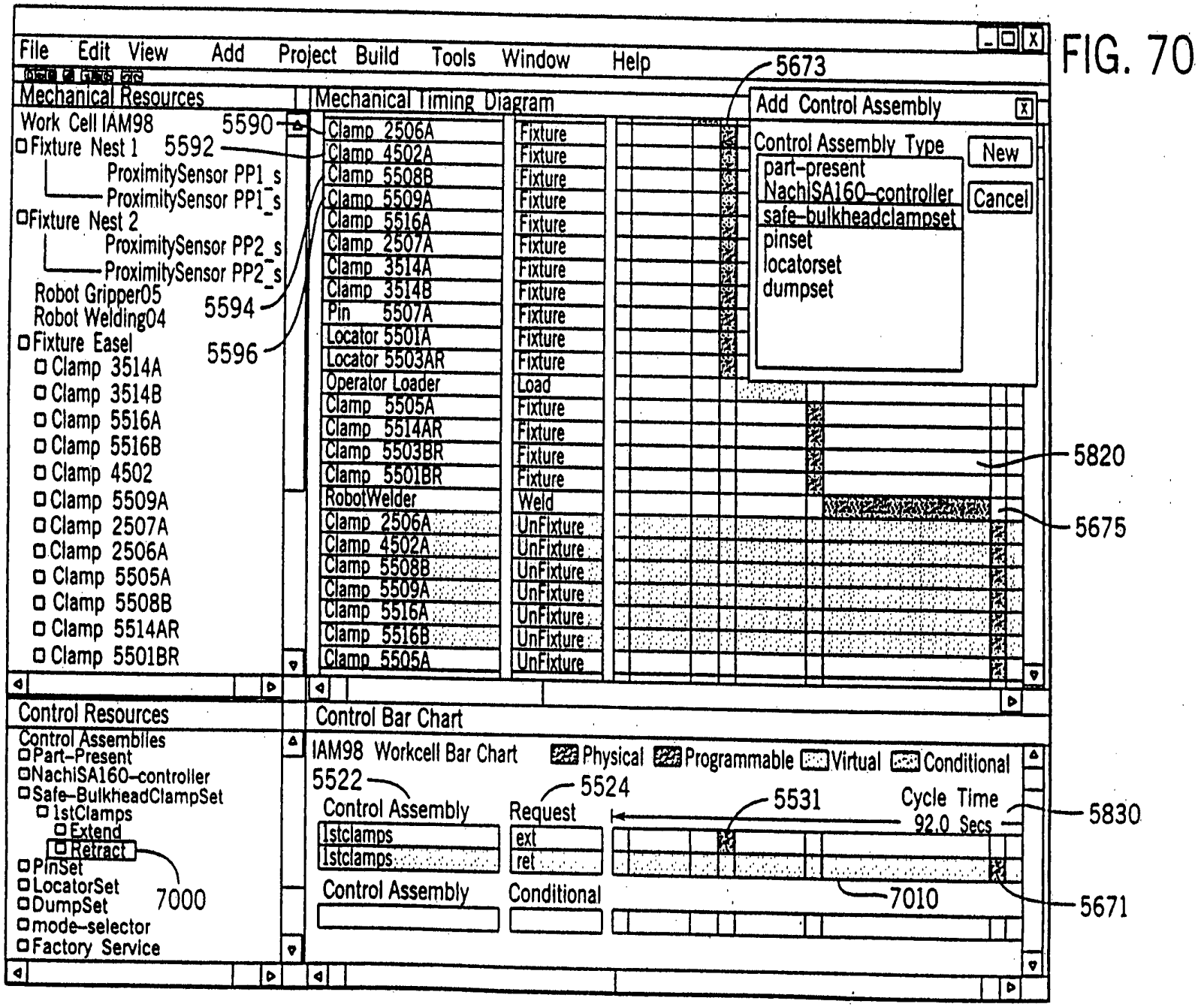

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Work Cell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
5590
5592
5594
5596
Mechanical Timing Diagram
Clamp 2506A Fixture
Clamp 4502A Fixture
Clamp 5508B Fixture
Clamp 5509A Fixture
Clamp 5516A Fixture
Clamp 2507A Fixture
Clamp 3514A Fixture
Clamp 3514B Fixture
Pin 5507A Fixture
Locator 5501A Fixture
Locator 5503AR Fixture
Operator Loader Load
Clamp 5505A Fixture
Clamp 5514AR Fixture
Clamp 5503BR Fixture
Clamp 5501BR Fixture
RobotWelder Weld
Clamp 2506A UnFixture
Clamp 4502A UnFixture
Clamp 5508B UnFixture
Clamp 5509A UnFixture
Clamp 5516A UnFixture
Clamp 5516B UnFixture
Clamp 5505A UnFixture
5673
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
5820
5675
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
7000
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
5522
5524
Control Assembly
Request
1stclamps
ext
1stclamps
ret
Control Assembly
Conditional
5531
Cycle Time
92.0 Secs
5830
7010
5671

FIG. 70

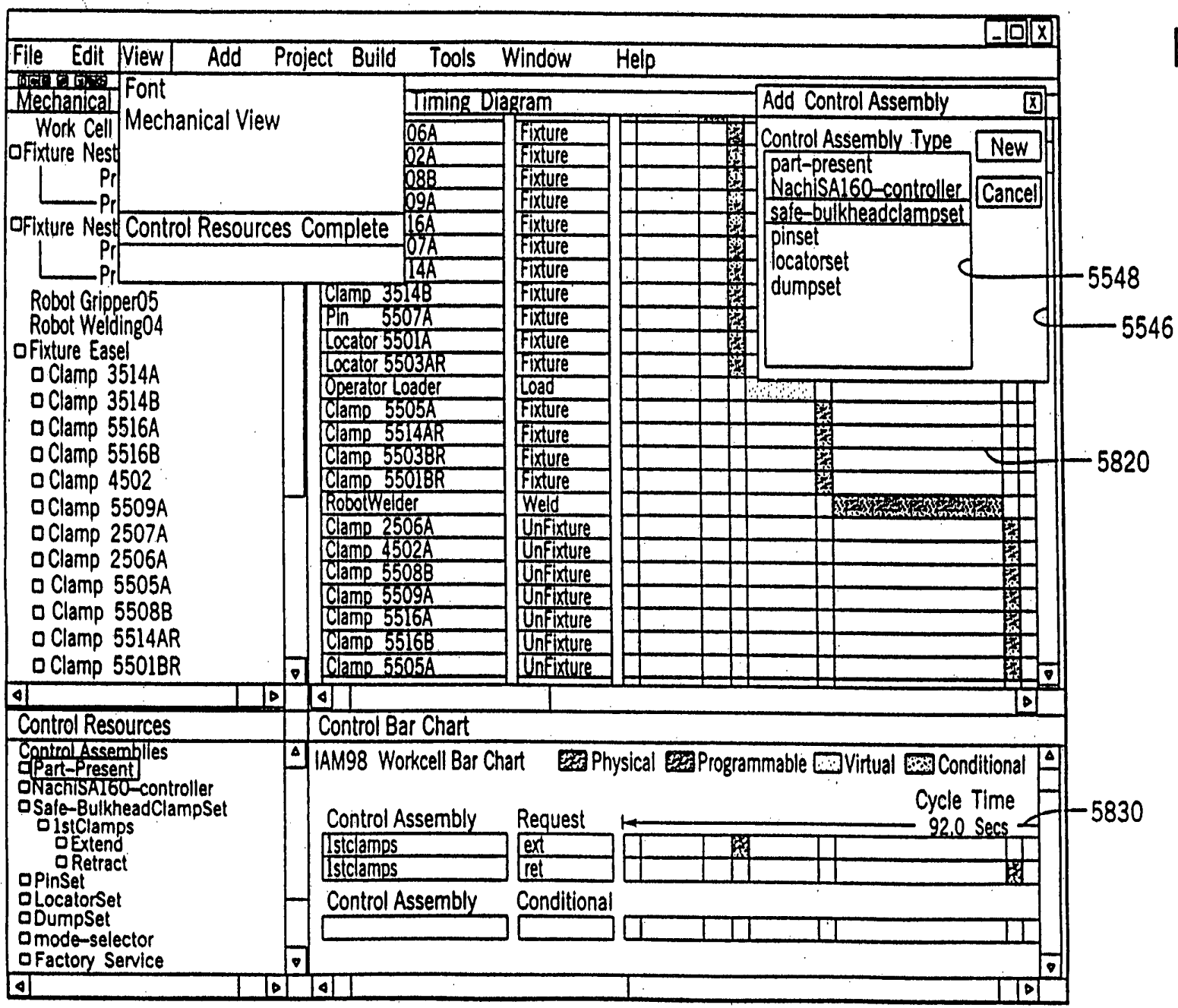
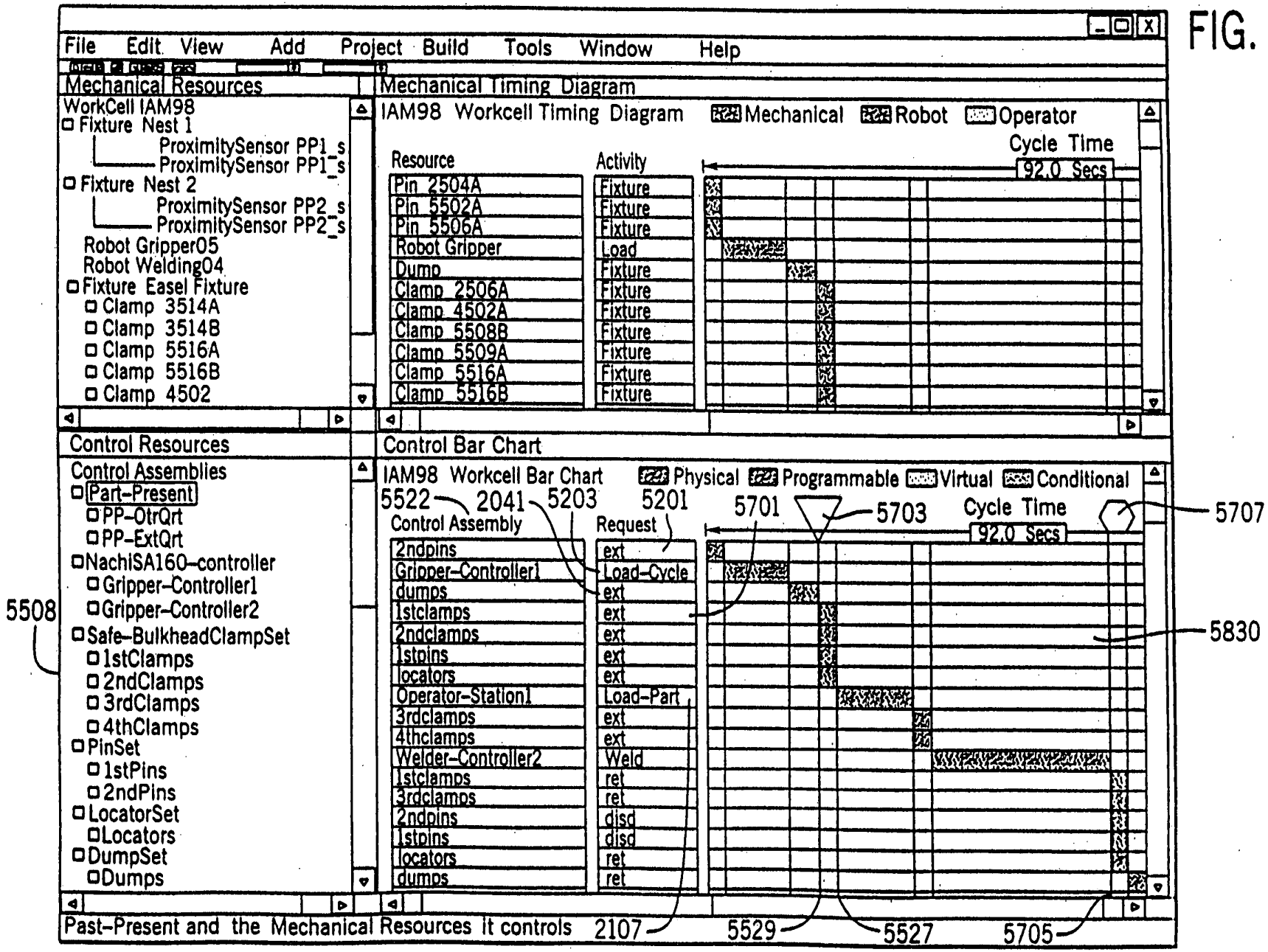

File Edit View Add Project Build Tools Window Help
Font
Mechanical View
Control Resources Complete
Mechanical
Work Cell
Fixture Nest
Fixture Nest
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Timing Diagram
Clamp 3514B Fixture
Pin 5507A Fixture
Locator 5501A Fixture
Locator 5503AR Fixture
Operator Loader Load
Clamp 5505A Fixture
Clamp 5514AR Fixture
Clamp 5503BR Fixture
Clamp 5501BR Fixture
RobotWelder Weld
Clamp 2506A UnFixture
Clamp 4502A UnFixture
Clamp 5508B UnFixture
Clamp 5509A UnFixture
Clamp 5516A UnFixture
Clamp 5516B UnFixture
Clamp 5505A UnFixture
Add Control Assembly
Control Assembly Type
New
Cancel
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
5548
5546
5820
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
5830
Control Assembly
Request
1stclamps
ext
1stclamps
ret
Control Assembly
Conditional

FIG. 71

FIG. 72


File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disd
Past-Present and the Mechanical Resources it controls
5522
2041
5203
5201
5701
5703
5707
5508
5830
2107
5529
5527
5705

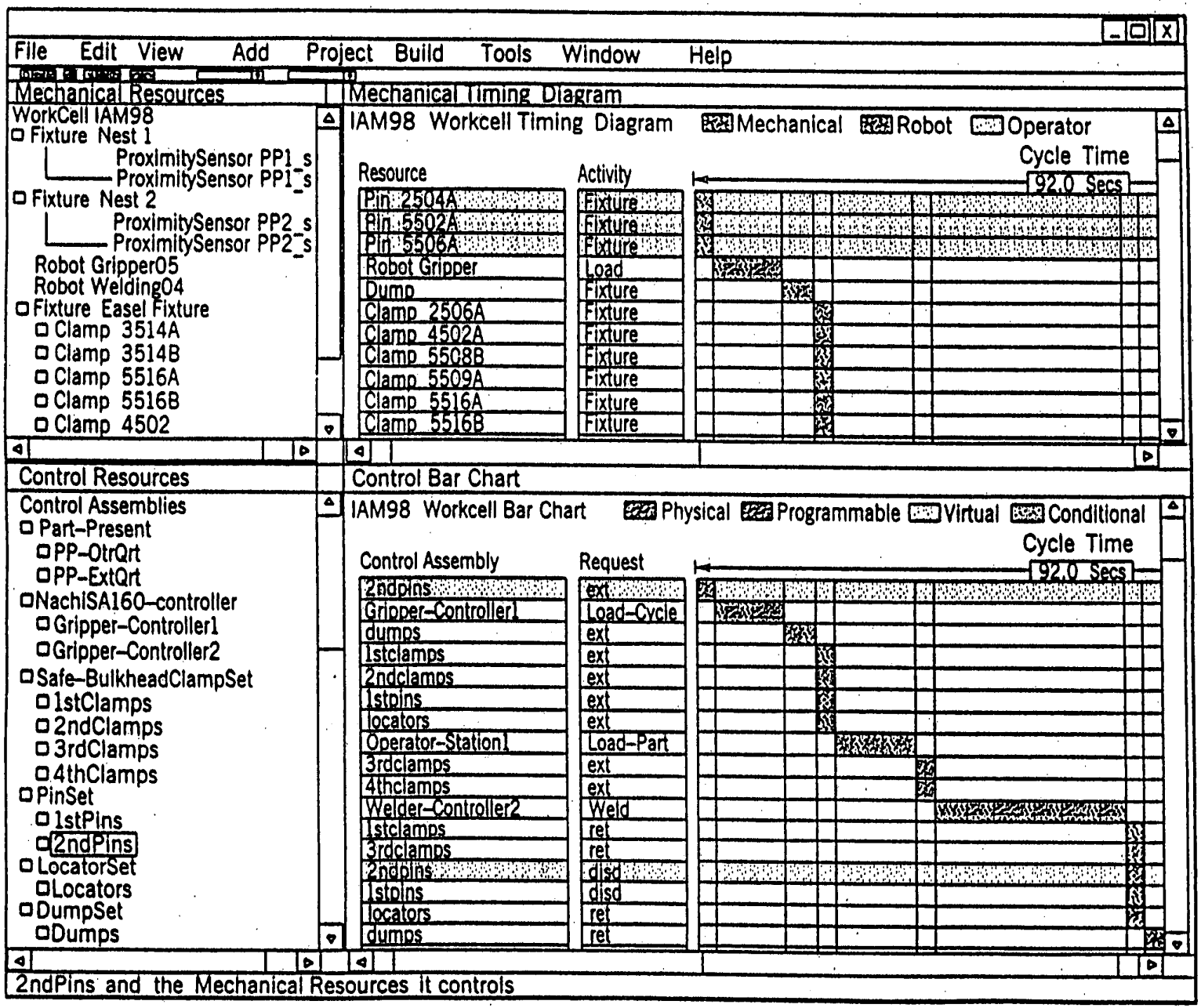

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disc
2ndPins and the Mechanical Resources it controls

FIG. 73

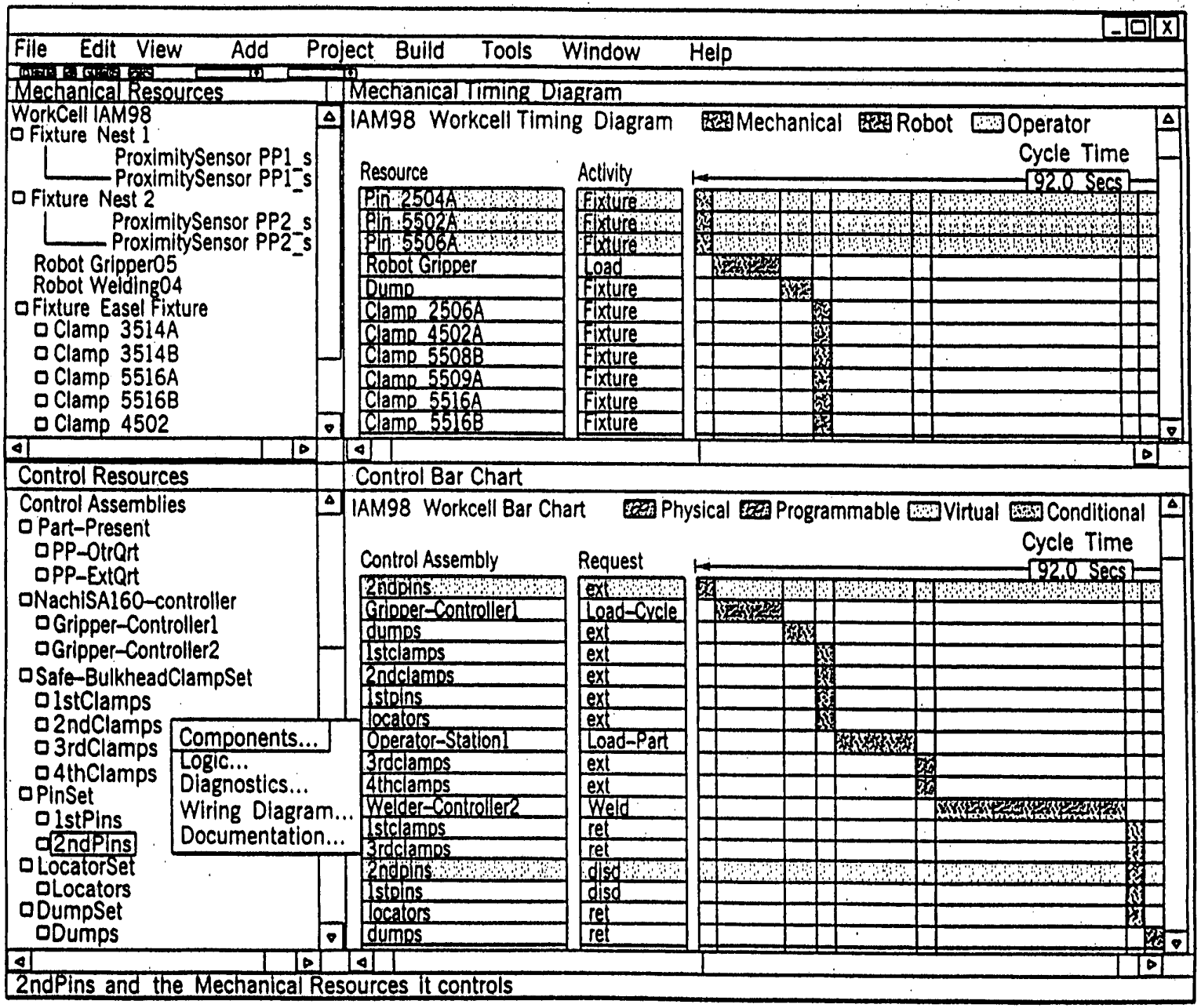

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Components...
Logic...
Diagnostics...
Wiring Diagram...
Documentation...
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disd
2ndPins and the Mechanical Resources it controls

FIG. 74

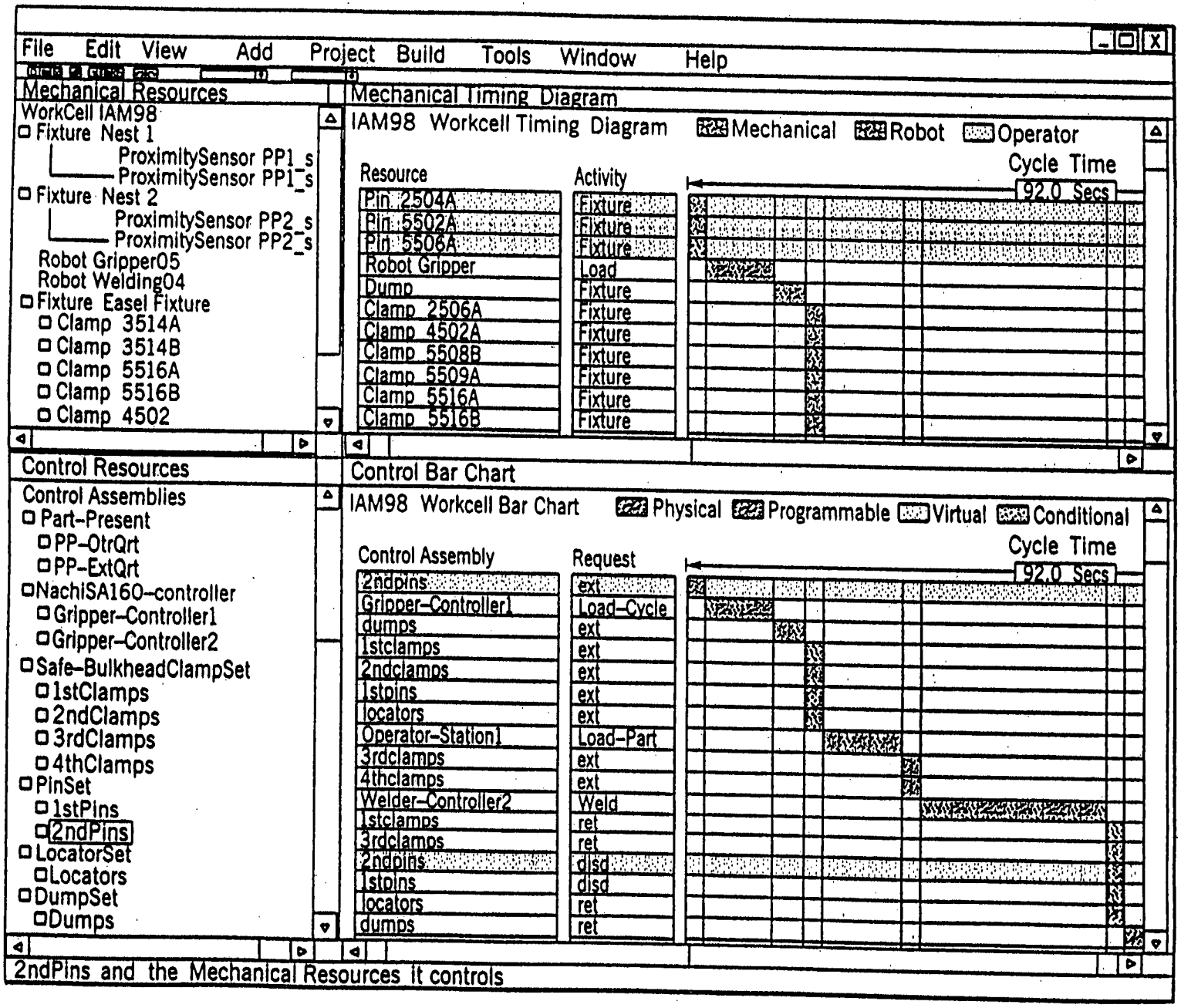

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Cycle Time
92.0 Secs
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disd
2ndPins and the Mechanical Resources it controls

FIG. 75

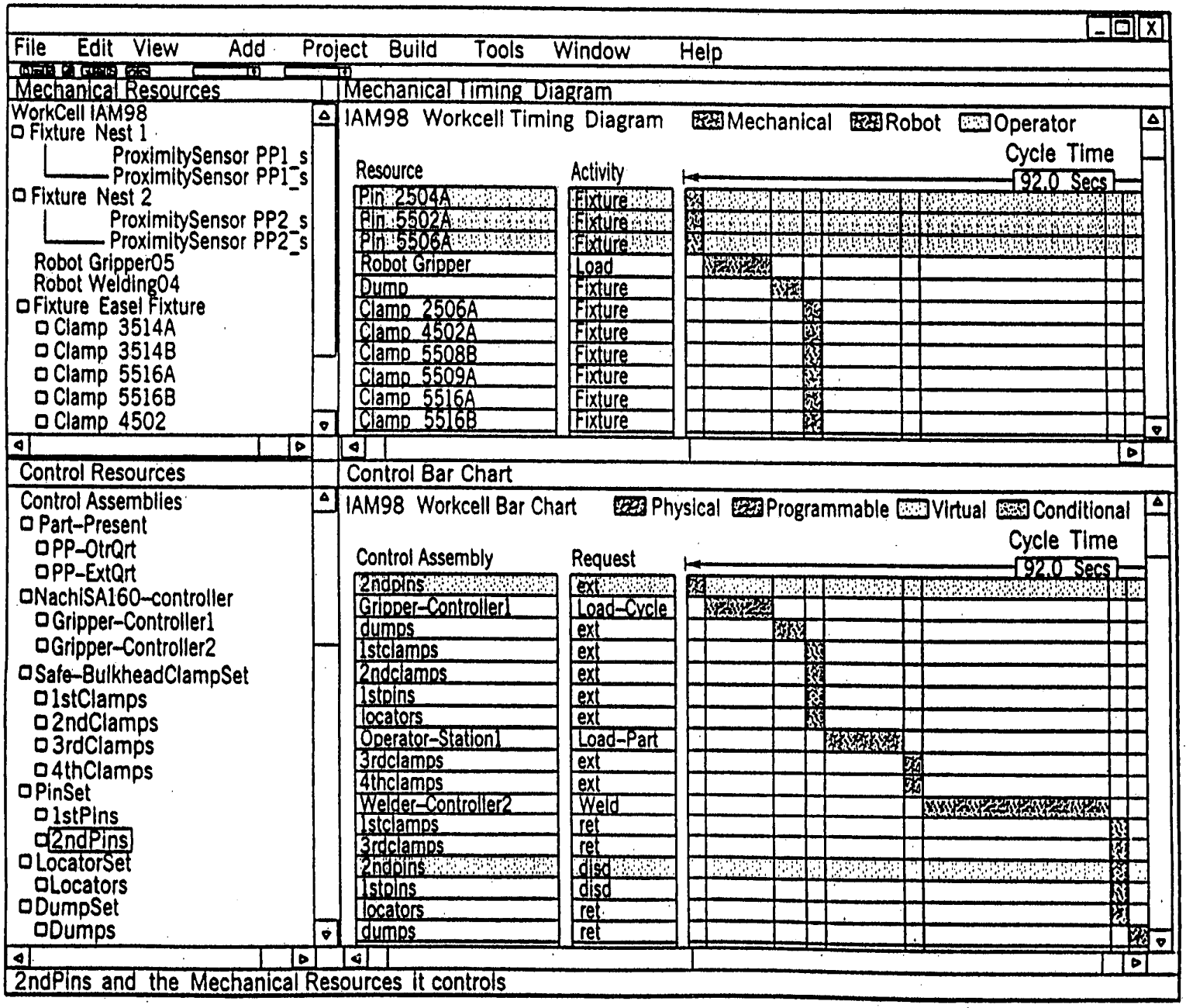

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disd
2ndPins and the Mechanical Resources it controls

FIG. 76

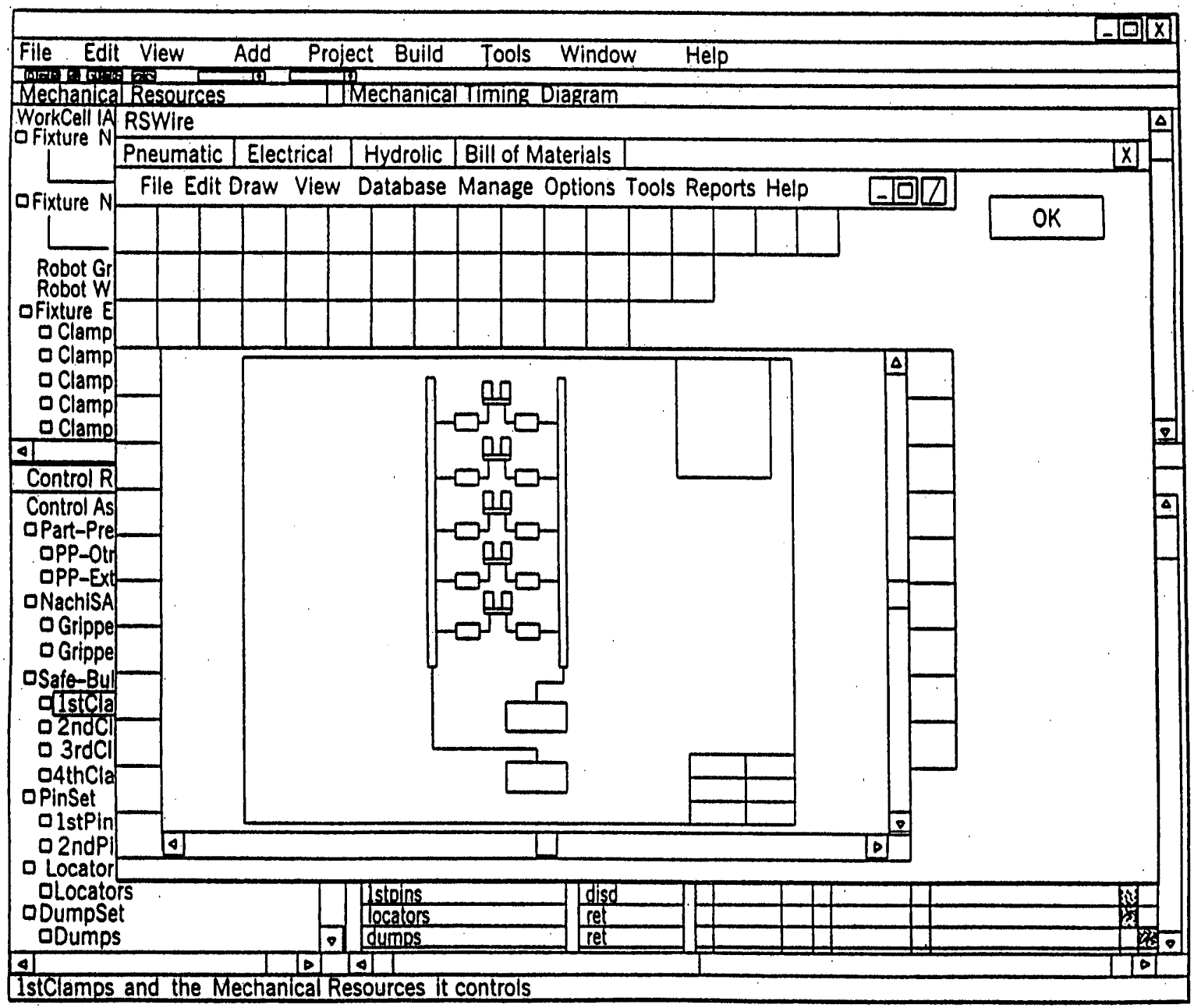

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IA
Fixture N
RSWire
Pneumatic
Electrical
Hydrolic
Bill of Materials
File Edit Draw View Database Manage Options Tools Reports Help
OK
Fixture N
Robot Gr
Robot W
Fixture E
Clamp
Clamp
Clamp
Clamp
Clamp
Control R
Control As
Part-Pre
PP-Otr
PP-Ext
NachiSA
Grippe
Grippe
Safe-Bul
1stCla
2ndCl
3rdCl
4thCla
PinSet
1stPin
2ndPi
Locator
Locators
DumpSet
Dumps
1stpins
locators
dumps
disd
ret
ret
1stClamps and the Mechanical Resources it controls

FIG. 77

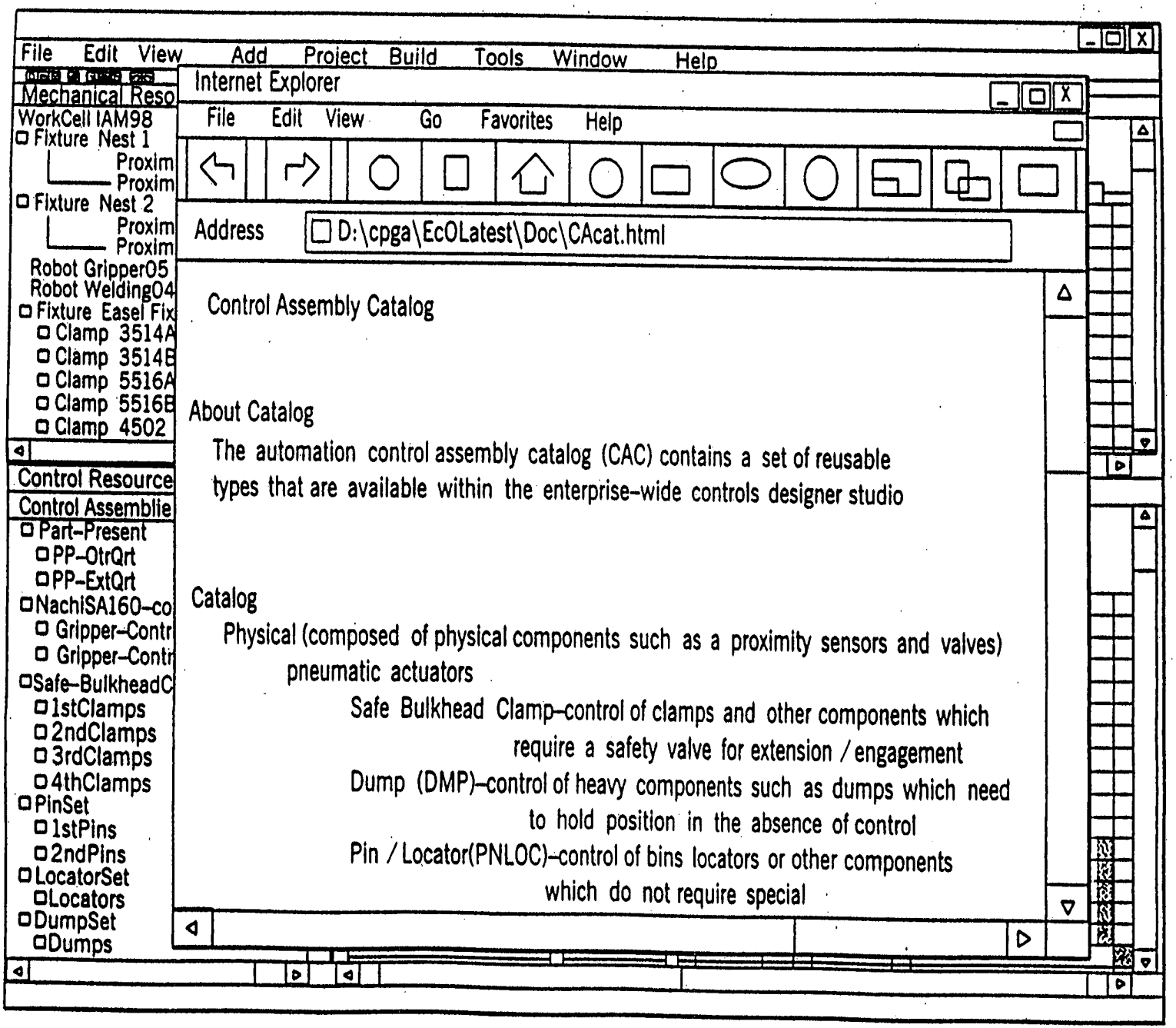

File Edit View Add Project Build Tools Window Help
Mechanical Reso
WorkCell IAM98
Fixture Nest 1
Proxim
Proxim
Fixture Nest 2
Proxim
Proxim
Robot Gripper05
Robot Welding04
Fixture Easel Fix
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Control Resource
Control Assemblie
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-co
Gripper-Contr
Gripper-Contr
Safe-BulkheadC
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Internet Explorer
File Edit View Go Favorites Help
Address D:\cpga\EcOLatest\Doc\CAcat.html
Control Assembly Catalog
About Catalog
The automation control assembly catalog (CAC) contains a set of reusable types that are available within the enterprise-wide controls designer studio
Catalog
Physical (composed of physical components such as a proximity sensors and valves) pneumatic actuators
Safe Bulkhead Clamp–control of clamps and other components which require a safety valve for extension / engagement
Dump (DMP)–control of heavy components such as dumps which need to hold position in the absence of control
Pin / Locator(PNLOC)–control of bins locators or other components which do not require special

FIG. 78

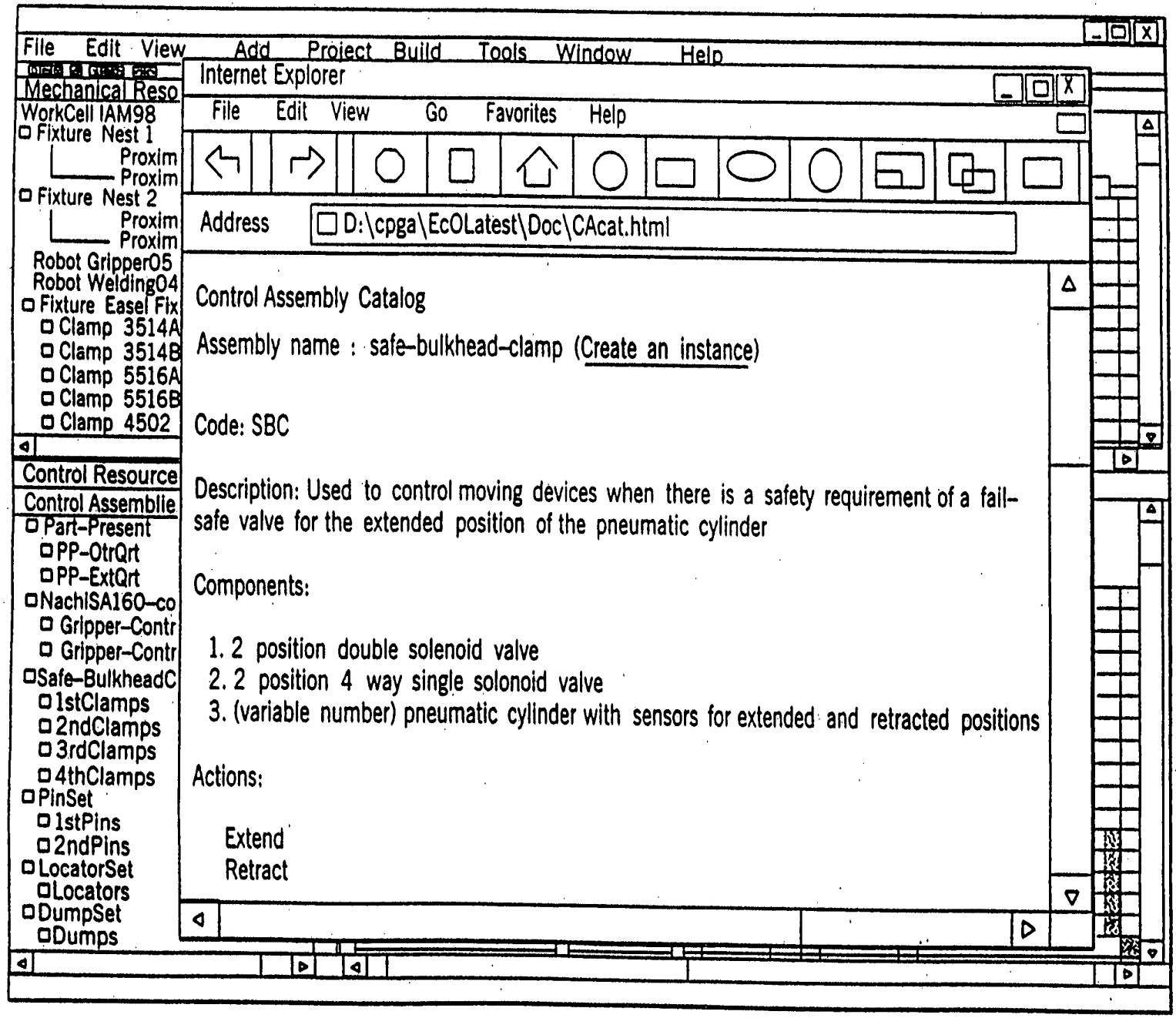

File Edit View Add Project Build Tools Window Help
Mechanical Reso
WorkCell IAM98
Fixture Nest 1
Proxim
Proxim
Fixture Nest 2
Proxim
Proxim
Robot Gripper05
Robot Welding04
Fixture Easel Fix
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Control Resource
Control Assemblie
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-co
Gripper-Contr
Gripper-Contr
Safe-BulkheadC
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Internet Explorer
File Edit View Go Favorites Help
Address
D:\cpga\EcOLatest\Doc\CAcat.html
Control Assembly Catalog
Assembly name : safe-bulkhead-clamp (Create an instance)
Code: SBC
Description: Used to control moving devices when there is a safety requirement of a fail-safe valve for the extended position of the pneumatic cylinder
Components:
1. 2 position double solenoid valve
2. 2 position 4 way single solonoid valve
3. (variable number) pneumatic cylinder with sensors for extended and retracted positions
Actions:
Extend
Retract

FIG. 79

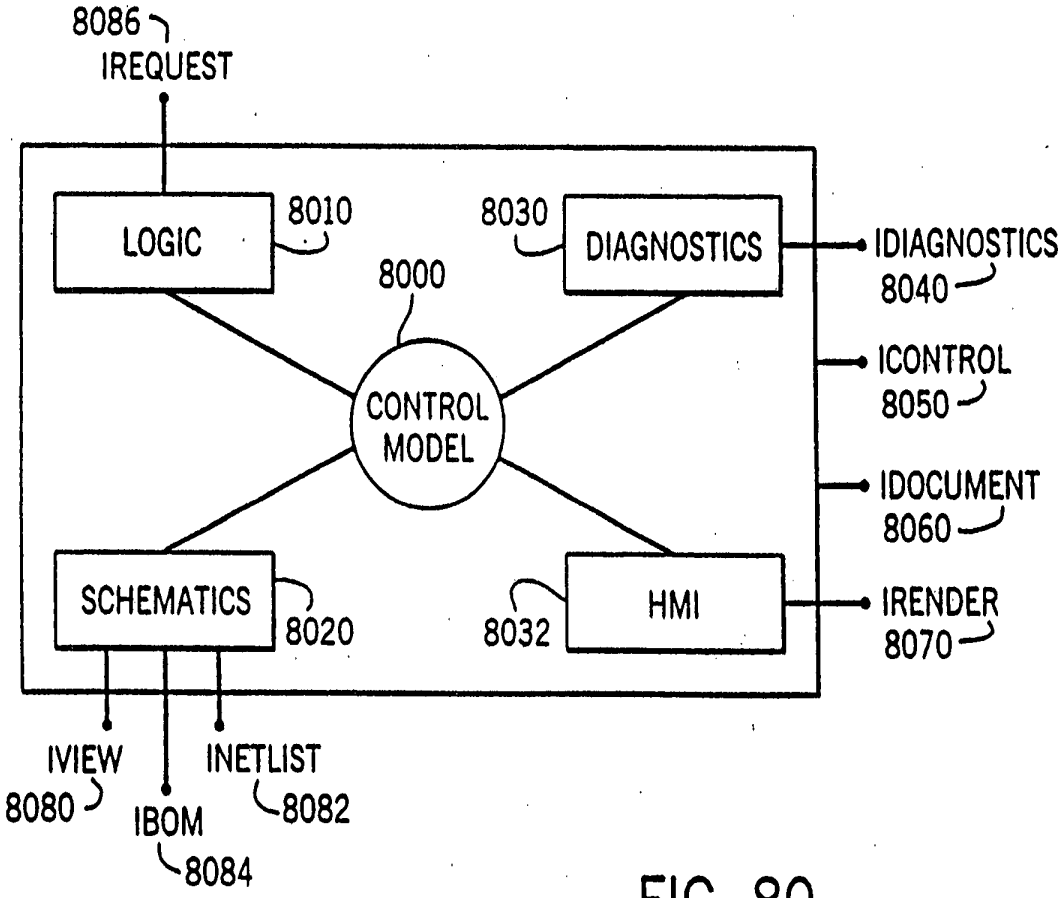

8086
IREQUEST
LOGIC
8010
8030
DIAGNOSTICS
IDIAGNOSTICS
8040
8000
CONTROL
MODEL
ICONTROL
8050
IDOCUMENT
8060
SCHEMATICS
8020
8032
HMI
IRENDER
8070
IVIEW
8080
IBOM
8084
INETLIST
8082

FIG. 80

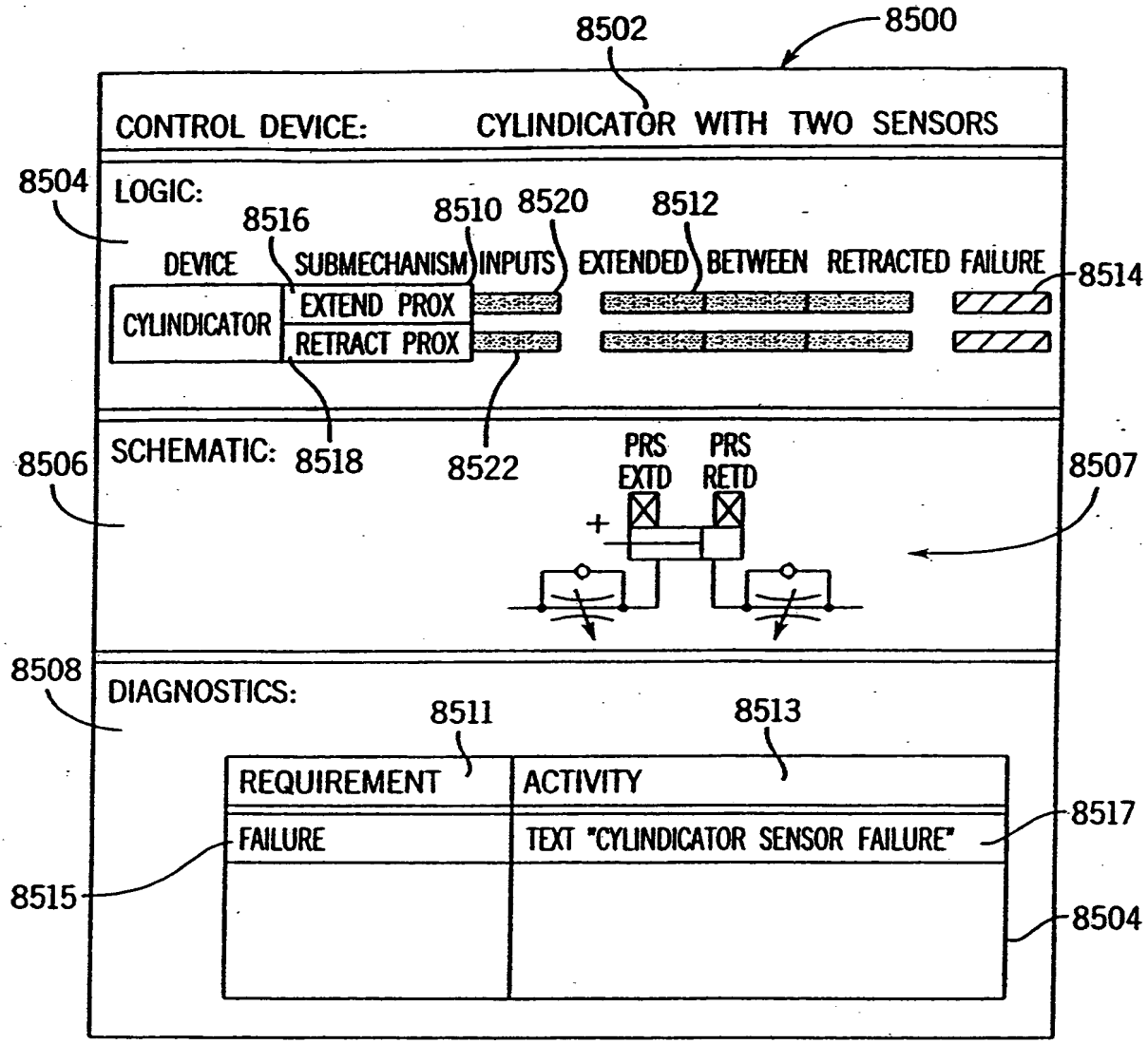

8502
8500
CONTROL DEVICE:
CYLINDICATOR WITH TWO SENSORS
8504
LOGIC:
8516
8510
8520
8512
DEVICE
SUBMECHANISM
INPUTS
EXTENDED
BETWEEN
RETRACTED
FAILURE
8514
CYLINDICATOR
EXTEND PROX
RETRACT PROX
8518
8522
8506
SCHEMATIC:
PRS EXTD
PRS RETD
8507
8508
DIAGNOSTICS:
8511
8513
REQUIREMENT
ACTIVITY
8517
FAILURE
TEXT "CYLINDICATOR SENSOR FAILURE"
8515
8504

FIG. 81

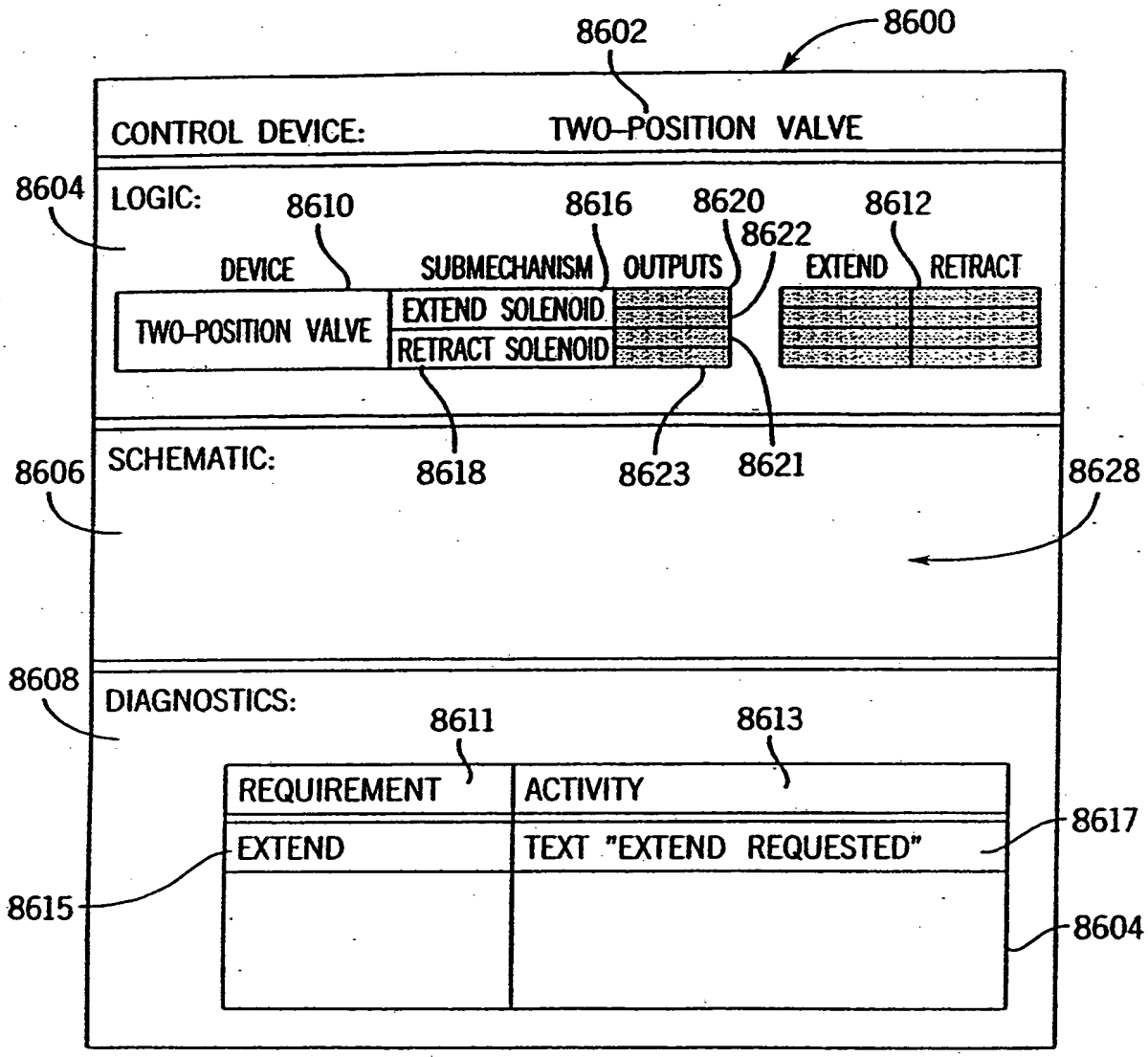

8600
8602
CONTROL DEVICE:
TWO-POSITION VALVE
8604
LOGIC:
8610
8616
8620
8622
8612
DEVICE
SUBMECHANISM
OUTPUTS
EXTEND
RETRACT
TWO-POSITION VALVE
EXTEND SOLENOID
RETRACT SOLENOID
8606
SCHEMATIC:
8618
8623
8621
8628
8608
DIAGNOSTICS:
8611
8613
REQUIREMENT
ACTIVITY
EXTEND
TEXT "EXTEND REQUESTED"
8617
8615
8604

FIG. 82

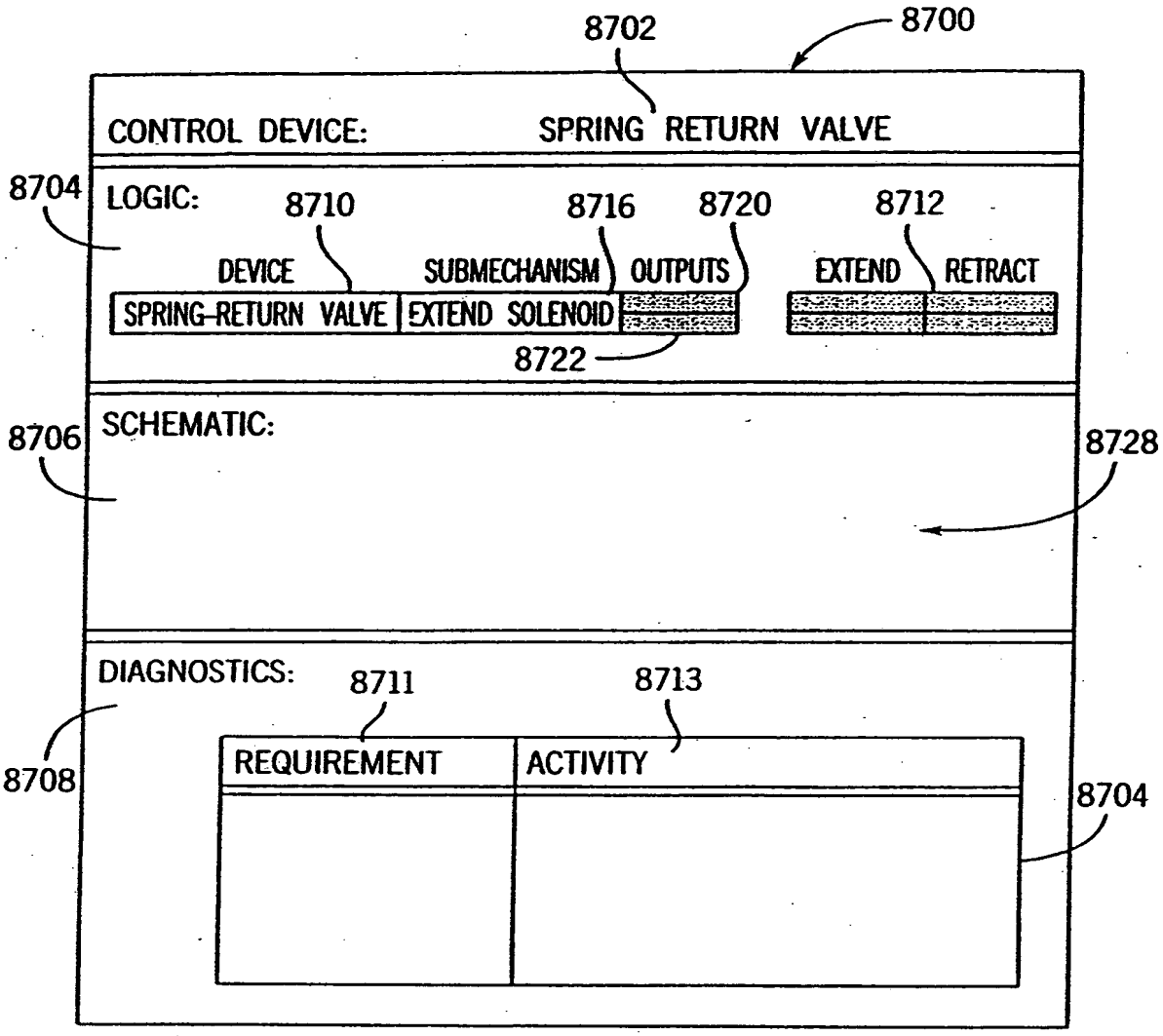

8702
8700
CONTROL DEVICE:
SPRING RETURN VALVE
8704
LOGIC:
8710
8716
8720
8712
DEVICE
SUBMECHANISM
OUTPUTS
EXTEND
RETRACT
SPRING-RETURN VALVE
EXTEND SOLENOID
8722
8706
SCHEMATIC:
8728
DIAGNOSTICS:
8711
8713
8708
REQUIREMENT
ACTIVITY
8704

FIG. 83

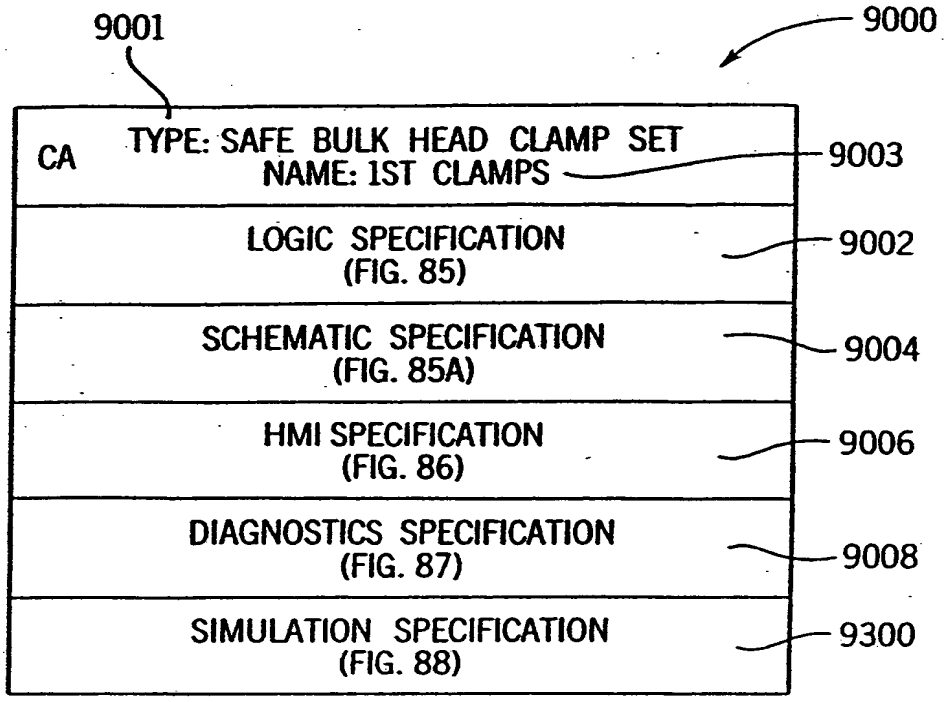


FIG. 84

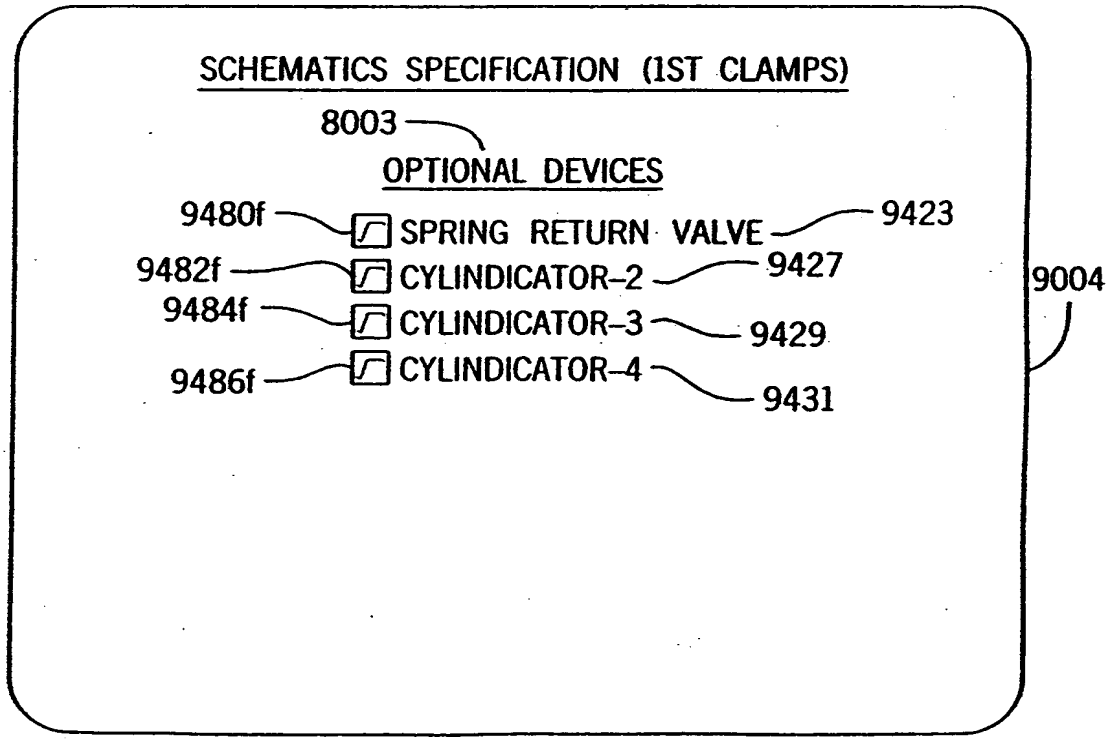


FIG. 85A

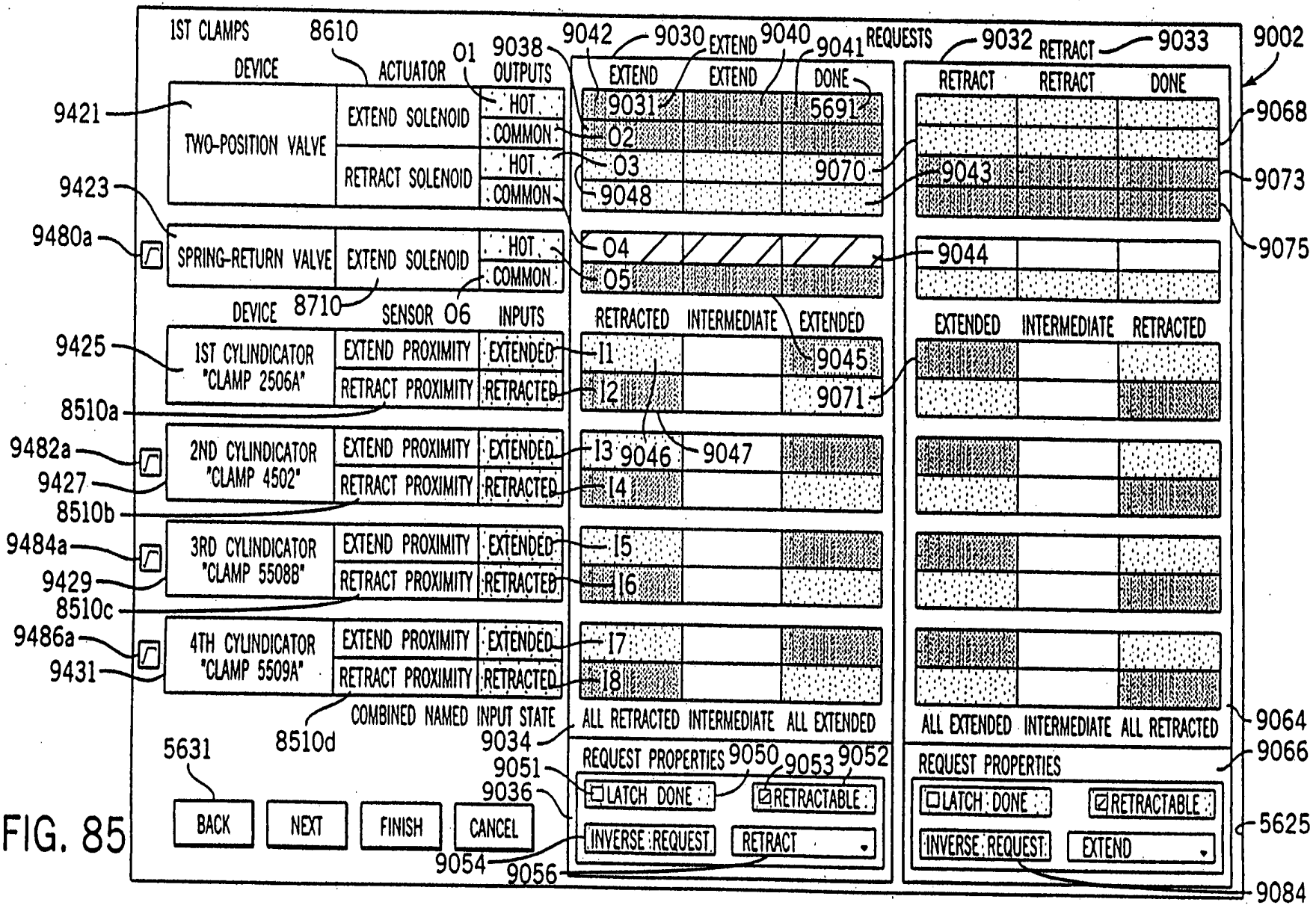

1ST CLAMPS
8610
DEVICE
ACTUATOR
01
9038
OUTPUTS
9042
9030
EXTEND
9040
EXTEND
9041
DONE
REQUESTS
9032
RETRACT
9033
RETRACT
RETRACT
DONE
9002
9421
TWO-POSITION VALVE
EXTEND SOLENOID
HOT
COMMON
RETRACT SOLENOID
HOT
COMMON
9031
02
03
9048
5691
9070
9068
9043
9073
9075
9423
9480a
SPRING-RETURN VALVE
EXTEND SOLENOID
HOT
COMMON
04
05
9044
DEVICE
8710
SENSOR
06
INPUTS
RETRACTED
INTERMEDIATE
EXTENDED
EXTENDED
INTERMEDIATE
RETRACTED
9425
1ST CYLINDICATOR "CLAMP 2506A"
EXTEND PROXIMITY
EXTENDED
RETRACT PROXIMITY
RETRACTED
11
12
9045
9071
8510a
9482a
9427
2ND CYLINDICATOR "CLAMP 4502"
EXTEND PROXIMITY
EXTENDED
RETRACT PROXIMITY
RETRACTED
13
9046
9047
14
8510b
9484a
9429
3RD CYLINDICATOR "CLAMP 5508B"
EXTEND PROXIMITY
EXTENDED
RETRACT PROXIMITY
RETRACTED
15
16
8510c
9486a
9431
4TH CYLINDICATOR "CLAMP 5509A"
EXTEND PROXIMITY
EXTENDED
RETRACT PROXIMITY
RETRACTED
17
18
8510d
COMBINED NAMED INPUT STATE
9034
ALL RETRACTED
INTERMEDIATE
ALL EXTENDED
ALL EXTENDED
INTERMEDIATE
ALL RETRACTED
9064
5631
BACK
NEXT
FINISH
CANCEL
REQUEST PROPERTIES
9050
9053
9052
9051
LATCH DONE
RETRACTABLE
9036
INVERSE REQUEST
RETRACT
9054
9056
REQUEST PROPERTIES
9066
LATCH DONE
RETRACTABLE
5625
INVERSE REQUEST
EXTEND
9084

FIG. 85

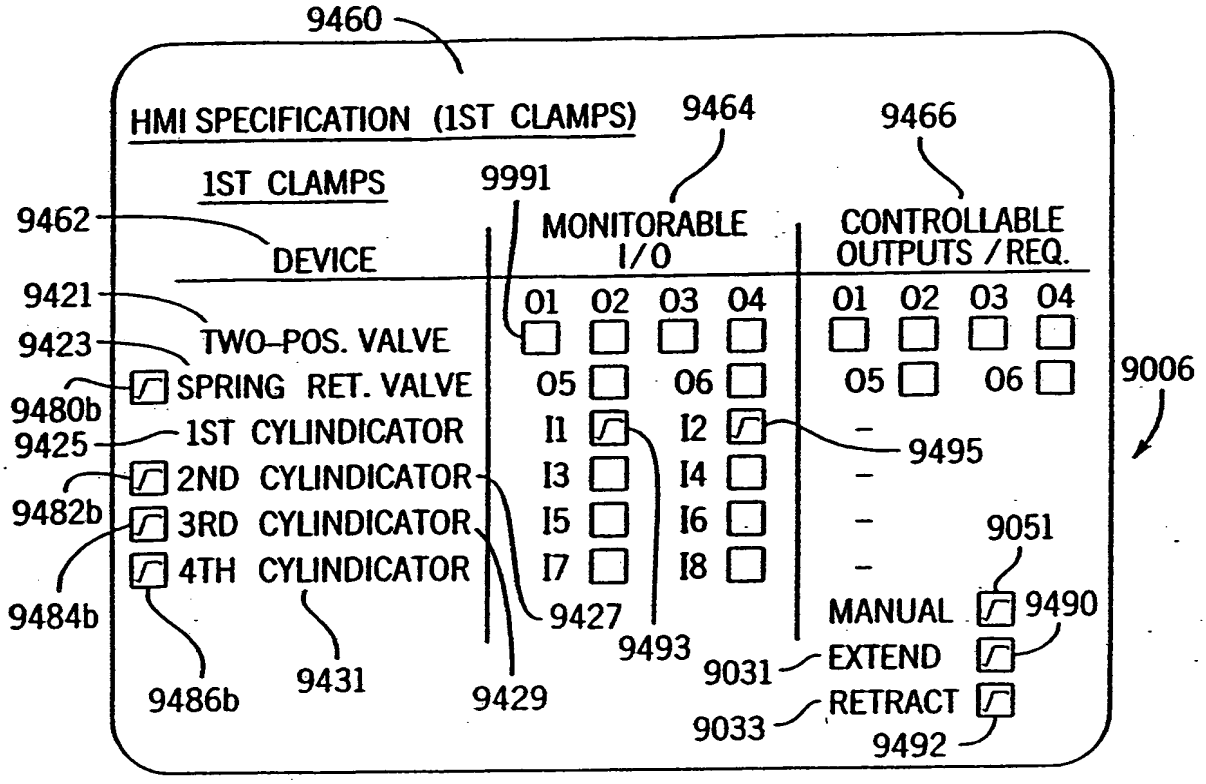

9460
HMI SPECIFICATION (1ST CLAMPS)
9464
9466
1ST CLAMPS
9991
9462
DEVICE
MONITORABLE I/O
CONTROLLABLE OUTPUTS / REQ.
9421
TWO-POS. VALVE
9423
SPRING RET. VALVE
9480b
1ST CYLINDICATOR
9425
2ND CYLINDICATOR
9482b
3RD CYLINDICATOR
4TH CYLINDICATOR
9484b
9486b
9431
9429
9427
9493
9495
9006
9051
MANUAL
9490
EXTEND
9031
RETRACT
9033
9492
01 02 03 04
05 06
I1 I2 I3 I4 I5 I6 I7 I8

FIG. 86

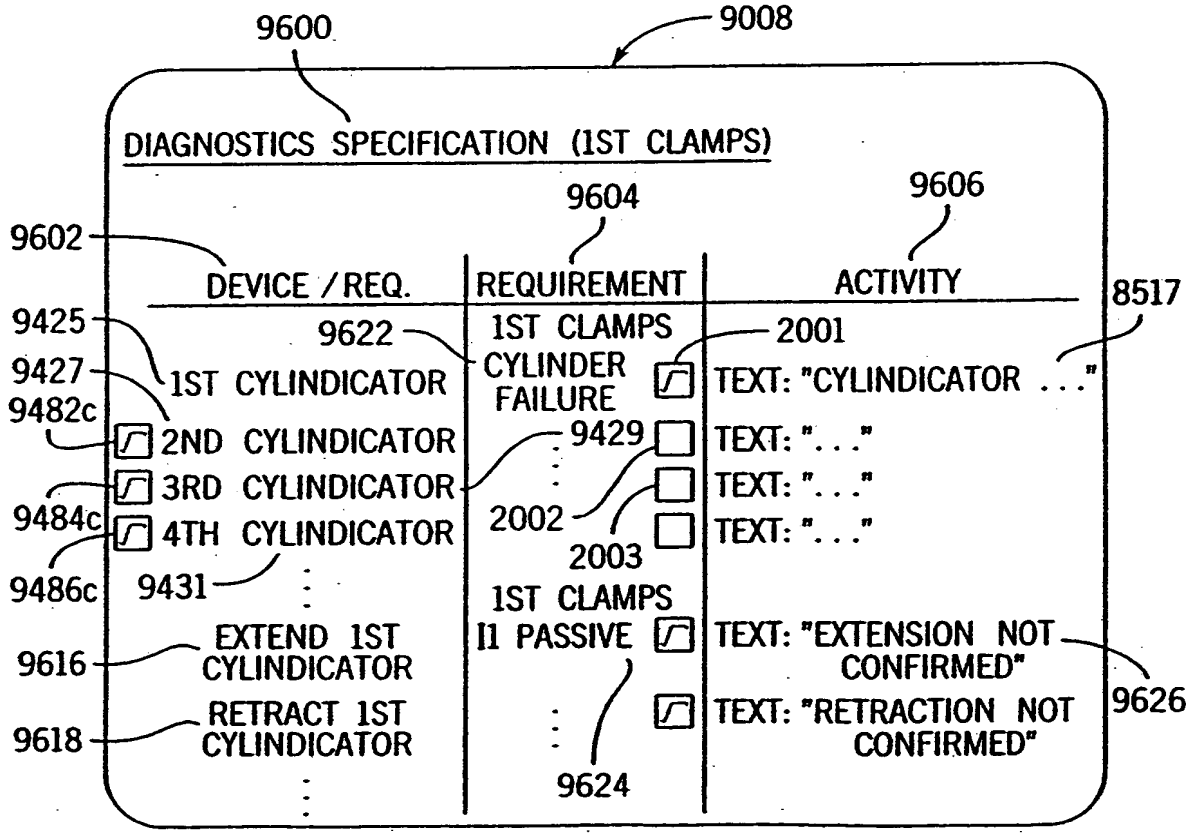

9600
9008
DIAGNOSTICS SPECIFICATION (1ST CLAMPS)
9604
9606
9602
DEVICE / REQ.
REQUIREMENT
ACTIVITY
8517
9425
1ST CYLINDICATOR
9622
1ST CLAMPS CYLINDER FAILURE
2001
TEXT: "CYLINDICATOR . . ."
9427
9482c
2ND CYLINDICATOR
9429
TEXT: ". . ."
3RD CYLINDICATOR
TEXT: ". . ."
9484c
4TH CYLINDICATOR
2002
2003
TEXT: ". . ."
9486c
9431
1ST CLAMPS I1 PASSIVE
9616
EXTEND 1ST CYLINDICATOR
TEXT: "EXTENSION NOT CONFIRMED"
9626
9618
RETRACT 1ST CYLINDICATOR
TEXT: "RETRACTION NOT CONFIRMED"
9624

FIG. 87

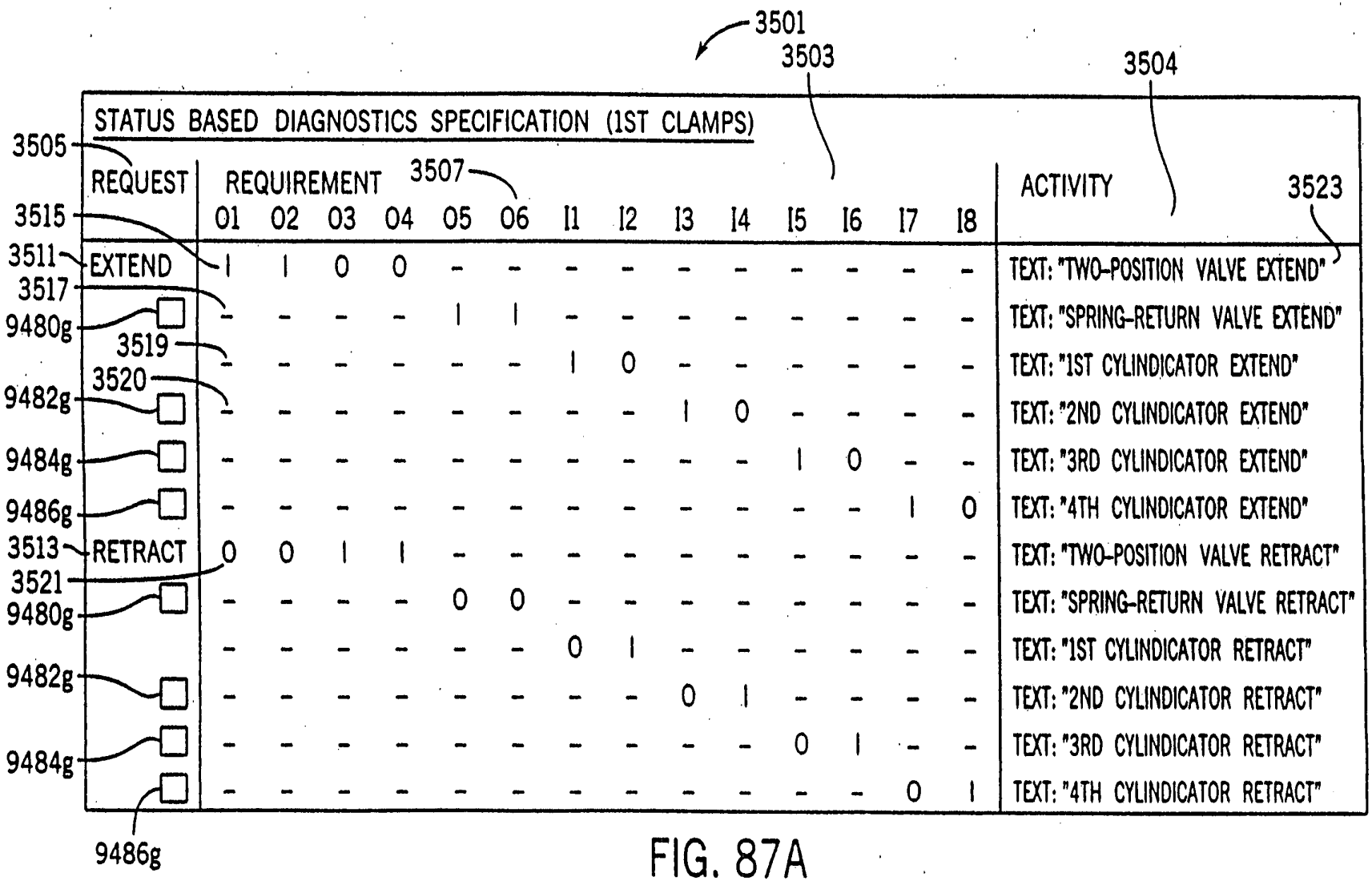

3501
3503
3504
STATUS BASED DIAGNOSTICS SPECIFICATION (1ST CLAMPS)
3505
REQUEST
REQUIREMENT
3507
3515
01 02 03 04 05 06 I1 I2 I3 I4 I5 I6 I7 I8
ACTIVITY
3523
3511 EXTEND 1 1 0 0 - - - - - - - - - - TEXT: "TWO-POSITION VALVE EXTEND"
3517
9480g - - - - 1 1 - - - - - - - - TEXT: "SPRING-RETURN VALVE EXTEND"
3519
- - - - - - 1 0 - - - - - - TEXT: "1ST CYLINDICATOR EXTEND"
3520
9482g - - - - - - - - 1 0 - - - - TEXT: "2ND CYLINDICATOR EXTEND"
9484g - - - - - - - - - - 1 0 - - TEXT: "3RD CYLINDICATOR EXTEND"
9486g - - - - - - - - - - - - 1 0 TEXT: "4TH CYLINDICATOR EXTEND"
3513 RETRACT 0 0 1 1 - - - - - - - - - - TEXT: "TWO-POSITION VALVE RETRACT"
3521
9480g - - - - 0 0 - - - - - - - - TEXT: "SPRING-RETURN VALVE RETRACT"
- - - - - - 0 1 - - - - - - TEXT: "1ST CYLINDICATOR RETRACT"
9482g - - - - - - - - 0 1 - - - - TEXT: "2ND CYLINDICATOR RETRACT"
9484g - - - - - - - - - - 0 1 - - TEXT: "3RD CYLINDICATOR RETRACT"
- - - - - - - - - - - - 0 1 TEXT: "4TH CYLINDICATOR RETRACT"
9486g

FIG. 87A

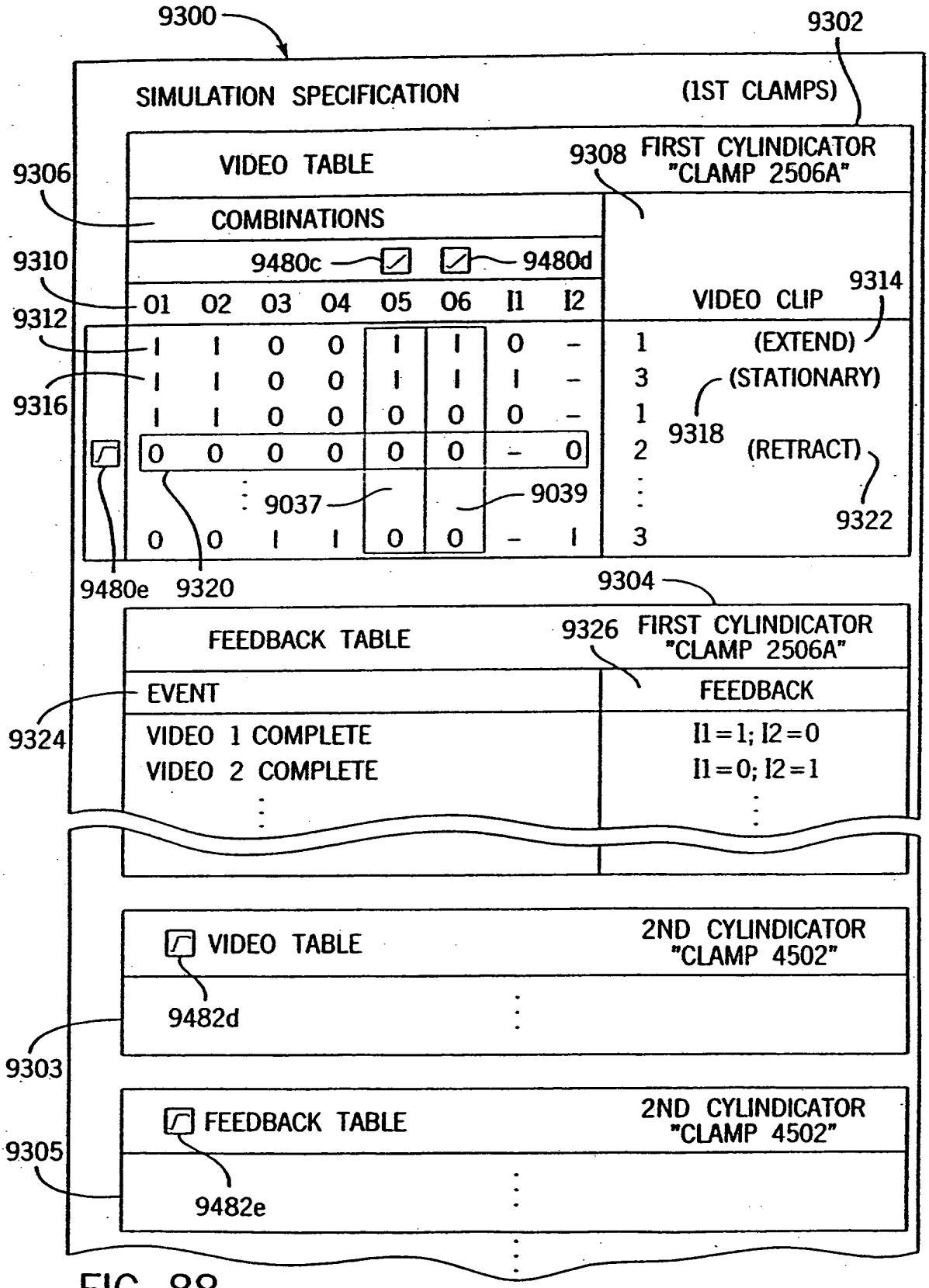

9300
9302
SIMULATION SPECIFICATION
(1ST CLAMPS)
VIDEO TABLE
9308 FIRST CYLINDICATOR "CLAMP 2506A"
9306
COMBINATIONS
9480c
9480d
9310
01 02 03 04 05 06 I1 I2
VIDEO CLIP
9314
9312
1 1 0 0 1 1 0 – 1 (EXTEND)
1 1 0 0 1 1 1 – 3 (STATIONARY)
9316
1 1 0 0 0 0 0 – 1
9318
0 0 0 0 0 0 – 0 2 (RETRACT)
9037
9039
0 0 1 1 0 0 – 1 3
9322
9480e
9320
9304
FEEDBACK TABLE
9326 FIRST CYLINDICATOR "CLAMP 2506A"
9324
EVENT
FEEDBACK
VIDEO 1 COMPLETE
I1=1; I2=0
VIDEO 2 COMPLETE
I1=0; I2=1
VIDEO TABLE
2ND CYLINDICATOR "CLAMP 4502"
9482d
9303
FEEDBACK TABLE
2ND CYLINDICATOR "CLAMP 4502"
9305
9482e

FIG. 88

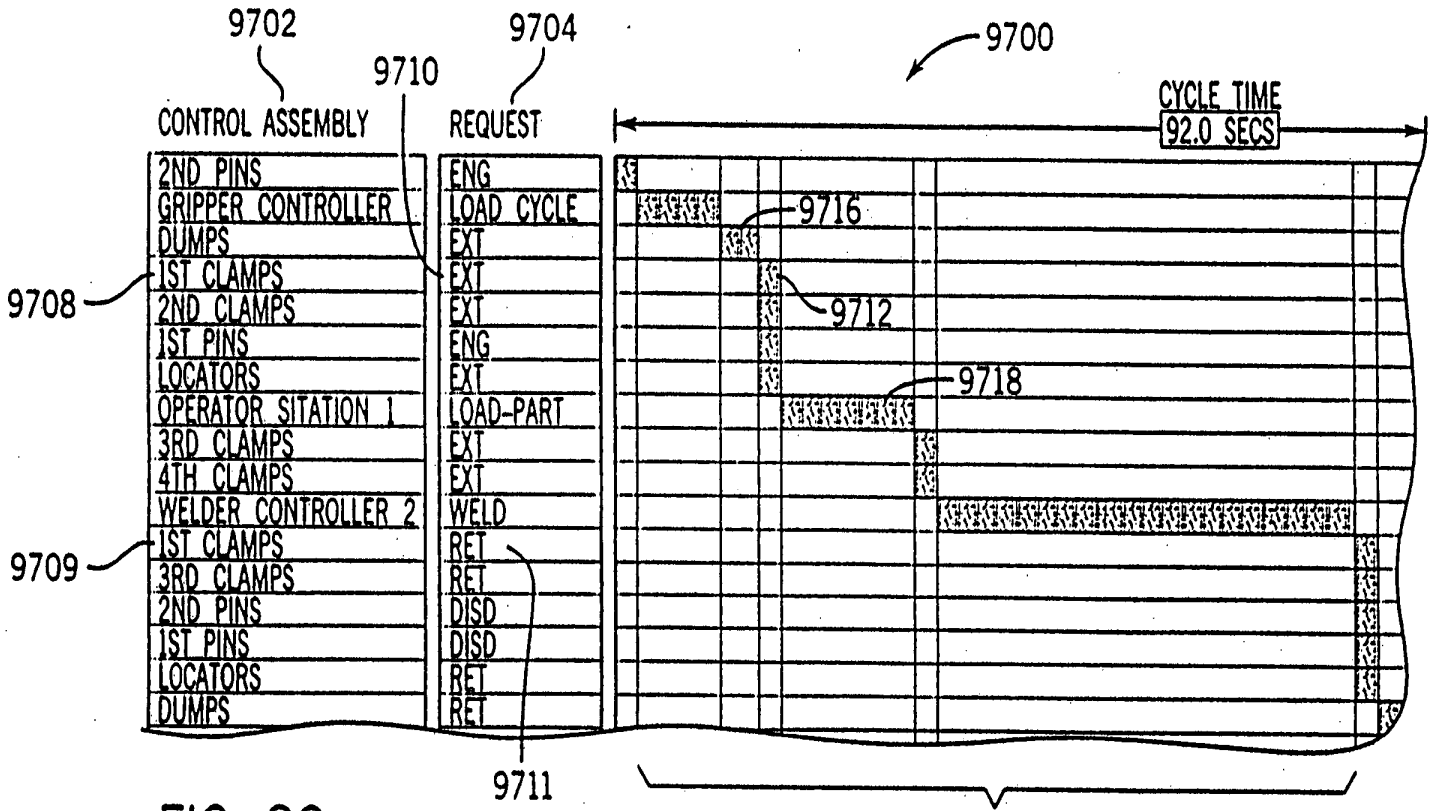

9702
9710
9704
9700
CONTROL ASSEMBLY
REQUEST
CYCLE TIME
92.0 SECS
2ND PINS
GRIPPER CONTROLLER
DUMPS
1ST CLAMPS
2ND CLAMPS
1ST PINS
LOCATORS
OPERATOR SITATION 1
3RD CLAMPS
4TH CLAMPS
WELDER CONTROLLER 2
1ST CLAMPS
3RD CLAMPS
2ND PINS
1ST PINS
LOCATORS
DUMPS
ENG
LOAD CYCLE
EXT
EXT
EXT
ENG
EXT
LOAD-PART
EXT
EXT
WELD
RET
RET
DISD
DISD
RET
RET
9708
9709
9716
9712
9718
9711
9706

FIG. 89

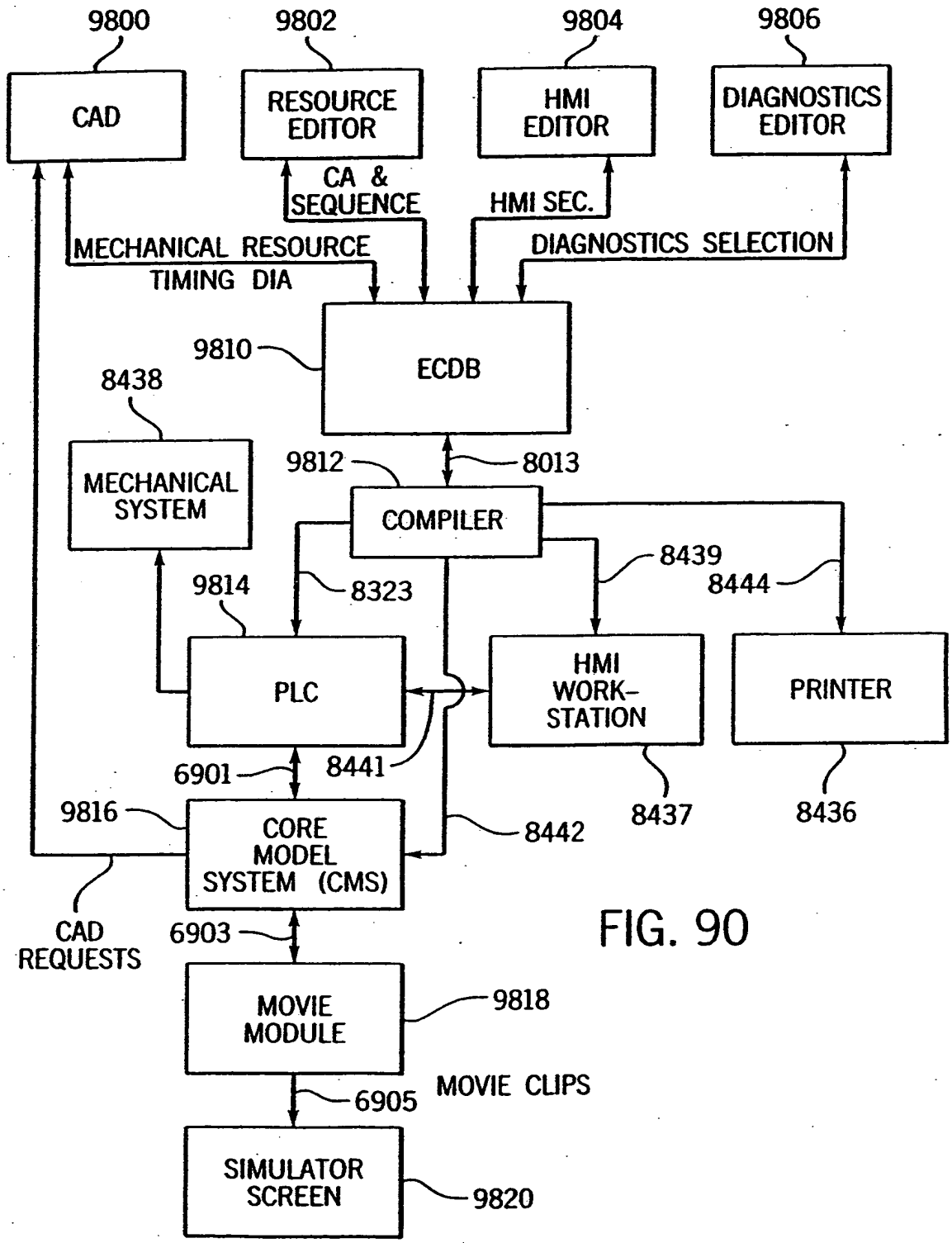

9800
9802
9804
9806
CAD
RESOURCE EDITOR
HMI EDITOR
DIAGNOSTICS EDITOR
CA & SEQUENCE
HMI SEC.
MECHANICAL RESOURCE TIMING DIA
DIAGNOSTICS SELECTION
9810
ECDB
8438
MECHANICAL SYSTEM
9812
8013
COMPILER
8439
8444
9814
8323
PLC
HMI WORK-STATION
PRINTER
6901
8441
8437
8436
9816
CORE MODEL SYSTEM (CMS)
8442
CAD REQUESTS
6903
MOVIE MODULE
9818
MOVIE CLIPS
6905
SIMULATOR SCREEN
9820

FIG. 90

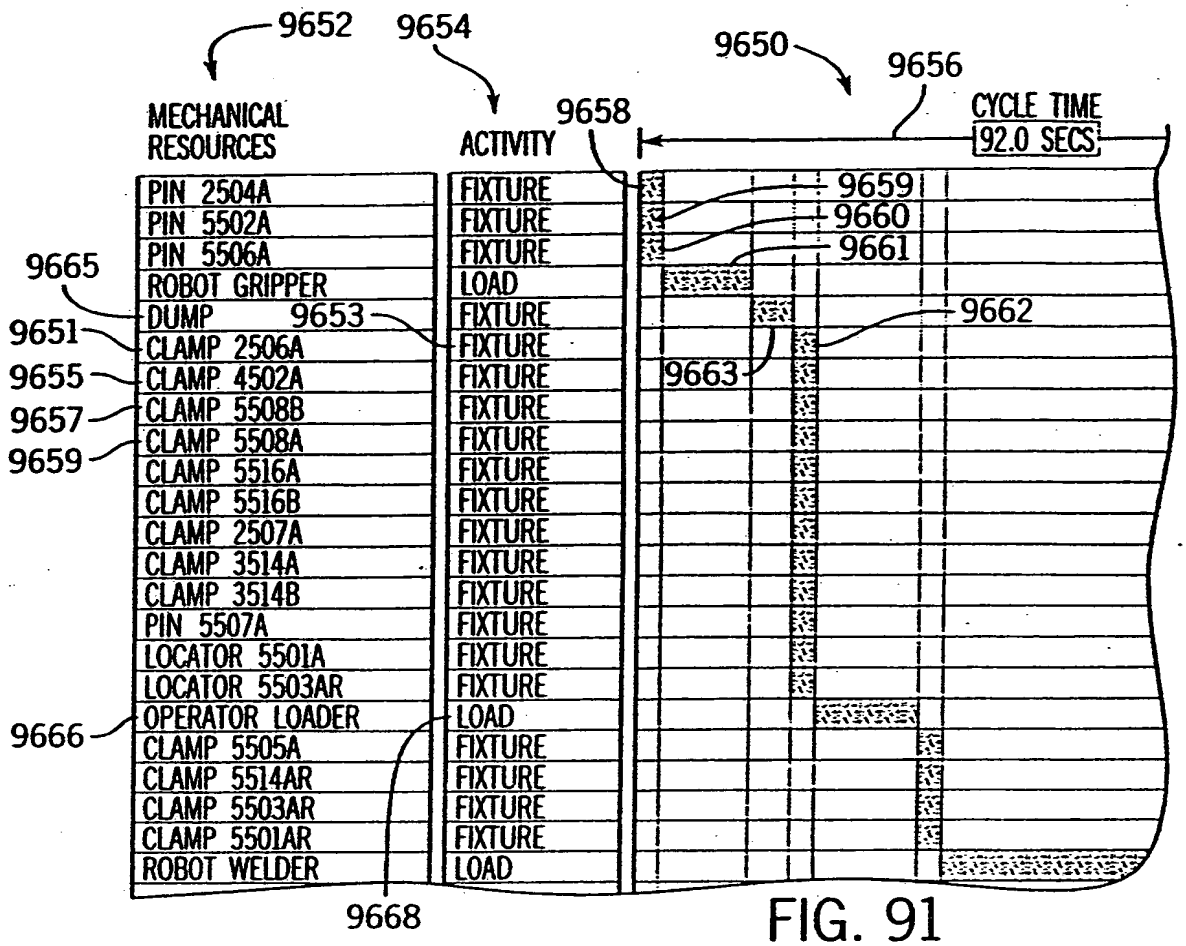

9652
9654
9650
9656
MECHANICAL RESOURCES
ACTIVITY
9658
CYCLE TIME
92.0 SECS
PIN 2504A
PIN 5502A
PIN 5506A
ROBOT GRIPPER
DUMP
CLAMP 2506A
CLAMP 4502A
CLAMP 5508B
CLAMP 5508A
CLAMP 5516A
CLAMP 5516B
CLAMP 2507A
CLAMP 3514A
CLAMP 3514B
PIN 5507A
LOCATOR 5501A
LOCATOR 5503AR
OPERATOR LOADER
CLAMP 5505A
CLAMP 5514AR
CLAMP 5503AR
CLAMP 5501AR
ROBOT WELDER
FIXTURE
LOAD
9653
9659
9660
9661
9662
9663
9665
9651
9655
9657
9659
9666
9668

FIG. 91

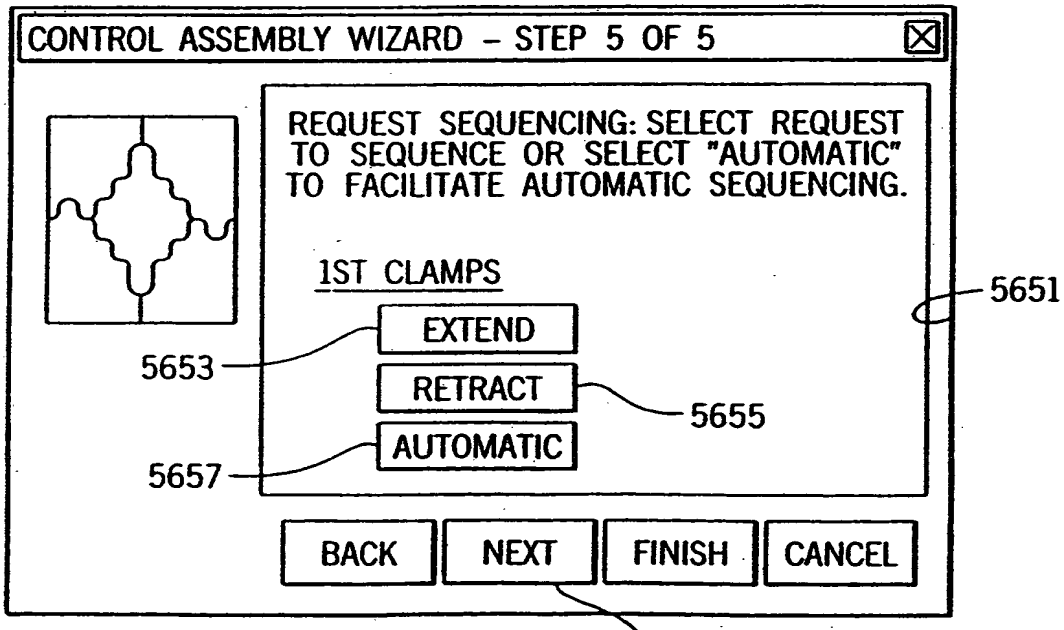

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
REQUEST SEQUENCING: SELECT REQUEST TO SEQUENCE OR SELECT "AUTOMATIC" TO FACILITATE AUTOMATIC SEQUENCING.
1ST CLAMPS
EXTEND
RETRACT
AUTOMATIC
BACK
NEXT
FINISH
CANCEL
5651
5653
5655
5657
5558

FIG. 92

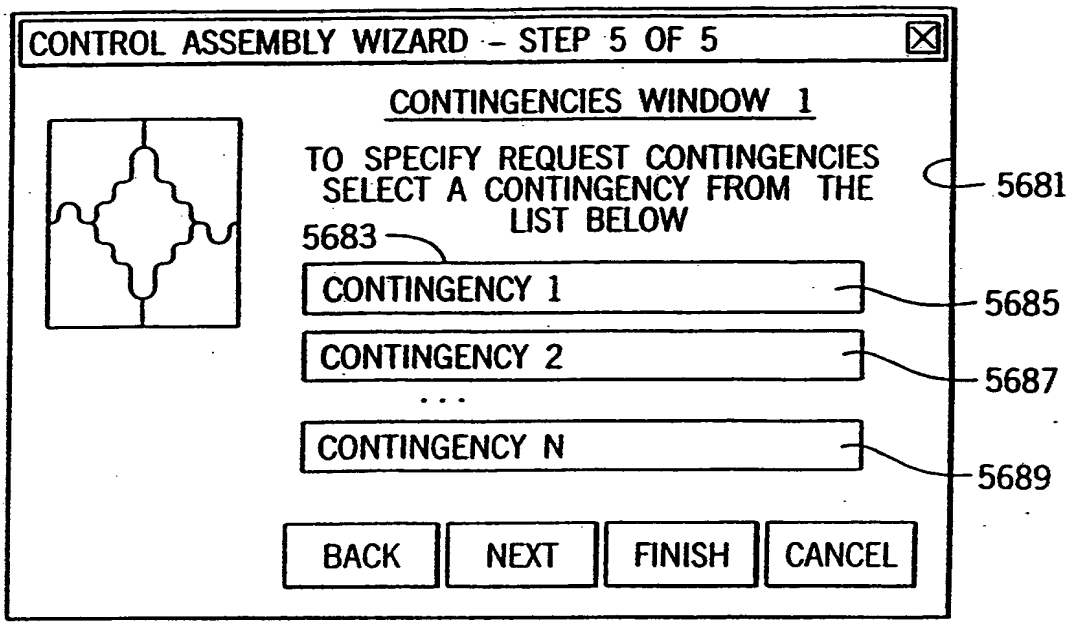

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
CONTINGENCIES WINDOW 1
TO SPECIFY REQUEST CONTINGENCIES SELECT A CONTINGENCY FROM THE LIST BELOW
5681
5683
CONTINGENCY 1
5685
CONTINGENCY 2
5687
CONTINGENCY N
5689
BACK
NEXT
FINISH
CANCEL

FIG. 93

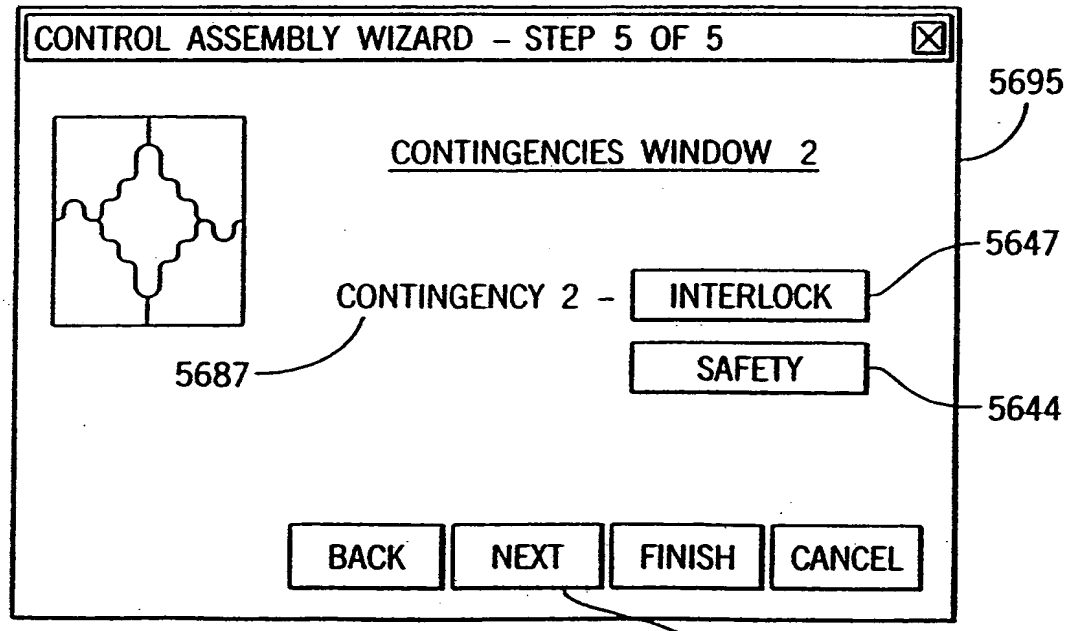

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
5695
CONTINGENCIES WINDOW 2
5647
CONTINGENCY 2 –
INTERLOCK
5687
SAFETY
5644
BACK
NEXT
FINISH
CANCEL
5558

FIG. 94

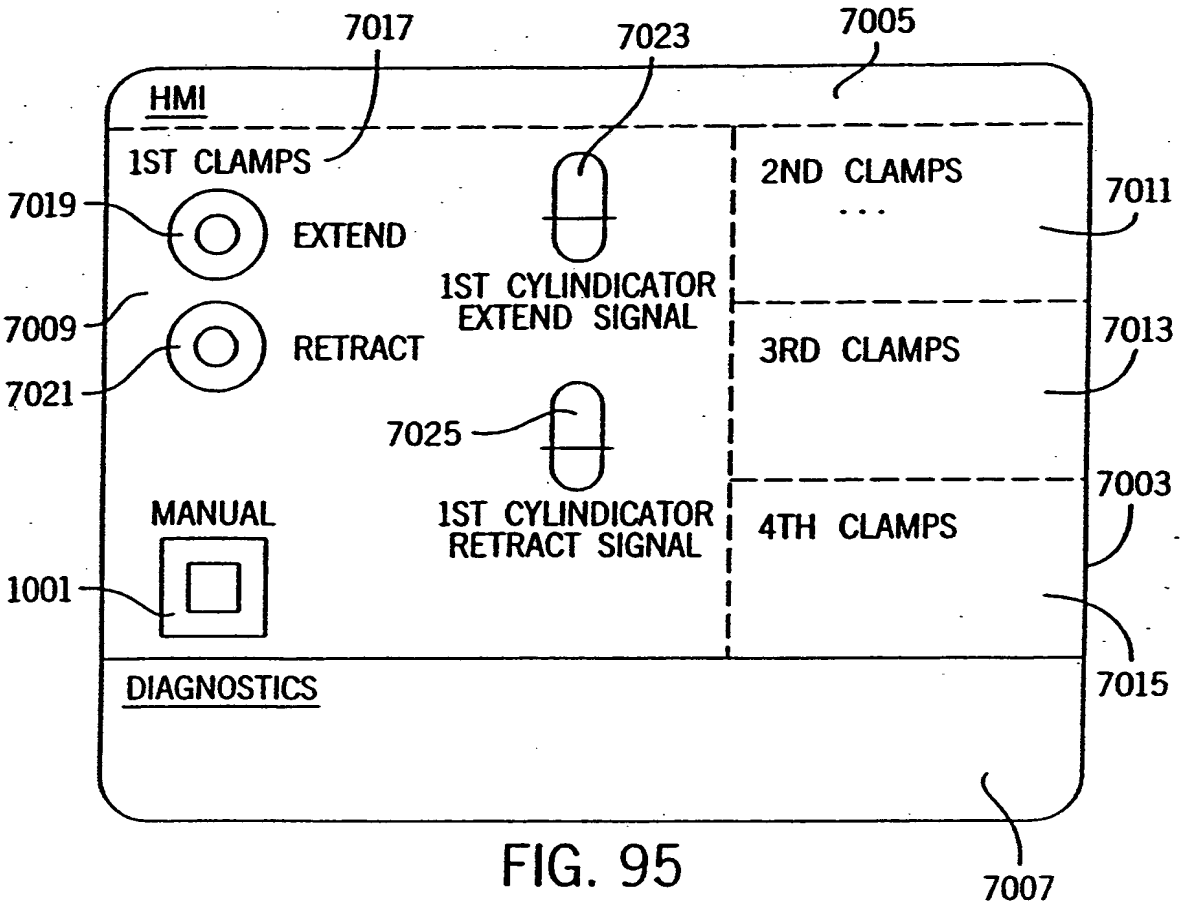

7017
7023
7005
HMI
1ST CLAMPS
2ND CLAMPS
...
7011
7019
EXTEND
1ST CYLINDICATOR
EXTEND SIGNAL
7009
RETRACT
3RD CLAMPS
7013
7021
7025
7003
MANUAL
1ST CYLINDICATOR
RETRACT SIGNAL
4TH CLAMPS
1001
7015
DIAGNOSTICS
7007

FIG. 95

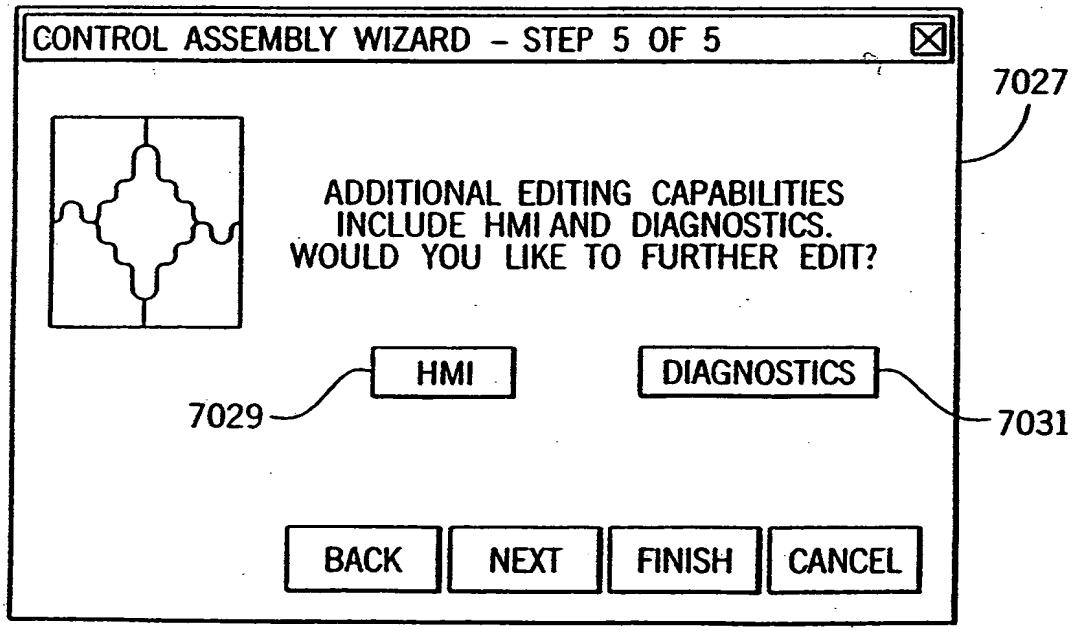

CONTROL ASSEMBLY WIZARD - STEP 5 OF 5
7027
ADDITIONAL EDITING CAPABILITIES
INCLUDE HMI AND DIAGNOSTICS.
WOULD YOU LIKE TO FURTHER EDIT?
HMI
DIAGNOSTICS
7029
7031
BACK
NEXT
FINISH
CANCEL

FIG. 96

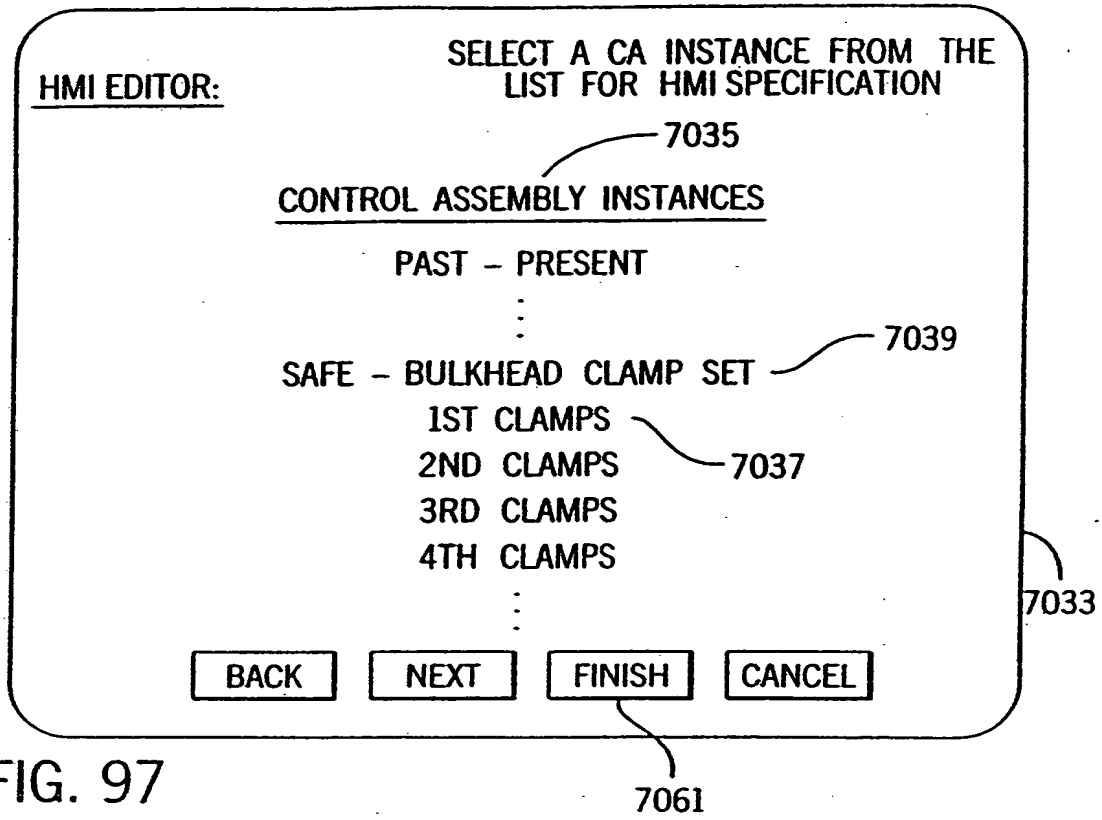

HMI EDITOR:
SELECT A CA INSTANCE FROM THE LIST FOR HMI SPECIFICATION
7035
CONTROL ASSEMBLY INSTANCES
PAST – PRESENT
7039
SAFE – BULKHEAD CLAMP SET
1ST CLAMPS
2ND CLAMPS
3RD CLAMPS
4TH CLAMPS
7037
7033
BACK
NEXT
FINISH
CANCEL
7061

FIG. 97

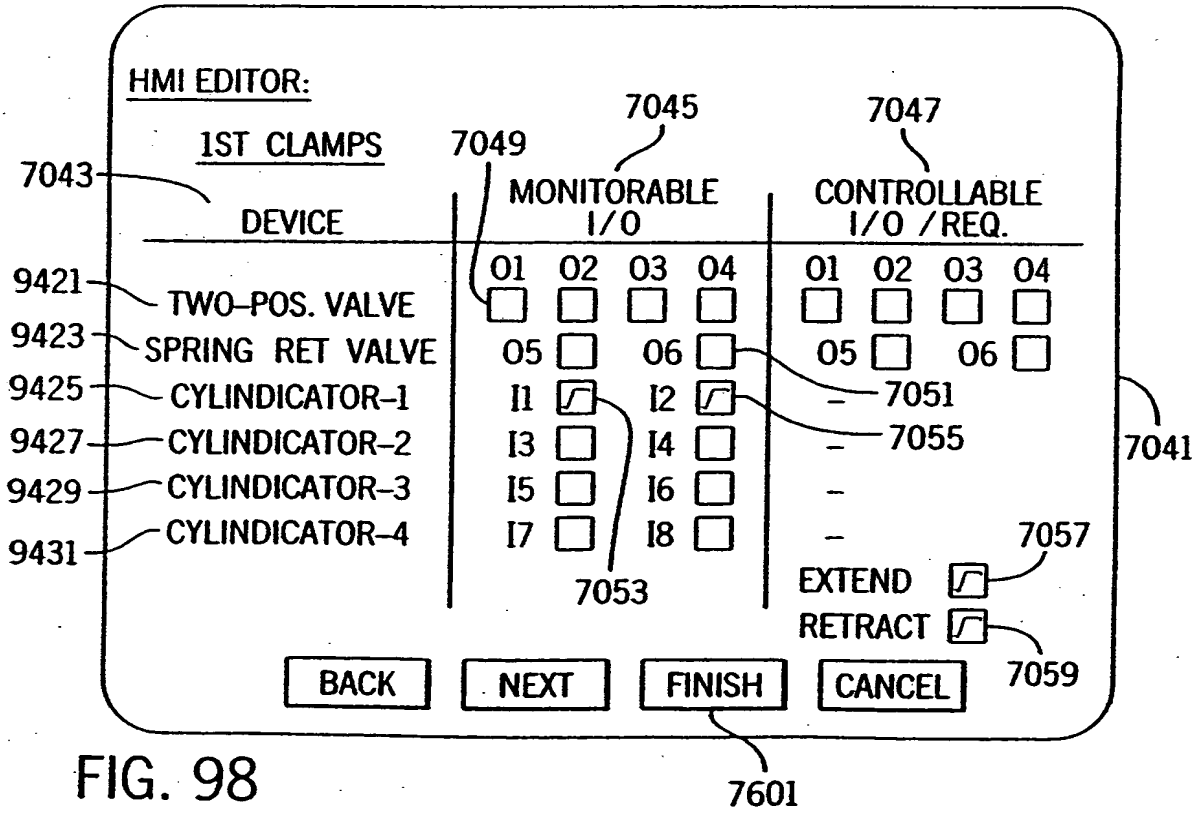

HMI EDITOR:
1ST CLAMPS
7043
7045
7047
7049
DEVICE
MONITORABLE I/O
CONTROLLABLE I/O /REQ.
01 02 03 04
01 02 03 04
9421 TWO-POS. VALVE
9423 SPRING RET VALVE
05 06
05 06
9425 CYLINDICATOR-1
I1 I2
7051
9427 CYLINDICATOR-2
I3 I4
7055
9429 CYLINDICATOR-3
I5 I6
9431 CYLINDICATOR-4
I7 I8
7057
EXTEND
RETRACT
7059
7053
7041
BACK
NEXT
FINISH
CANCEL
7601

FIG. 98

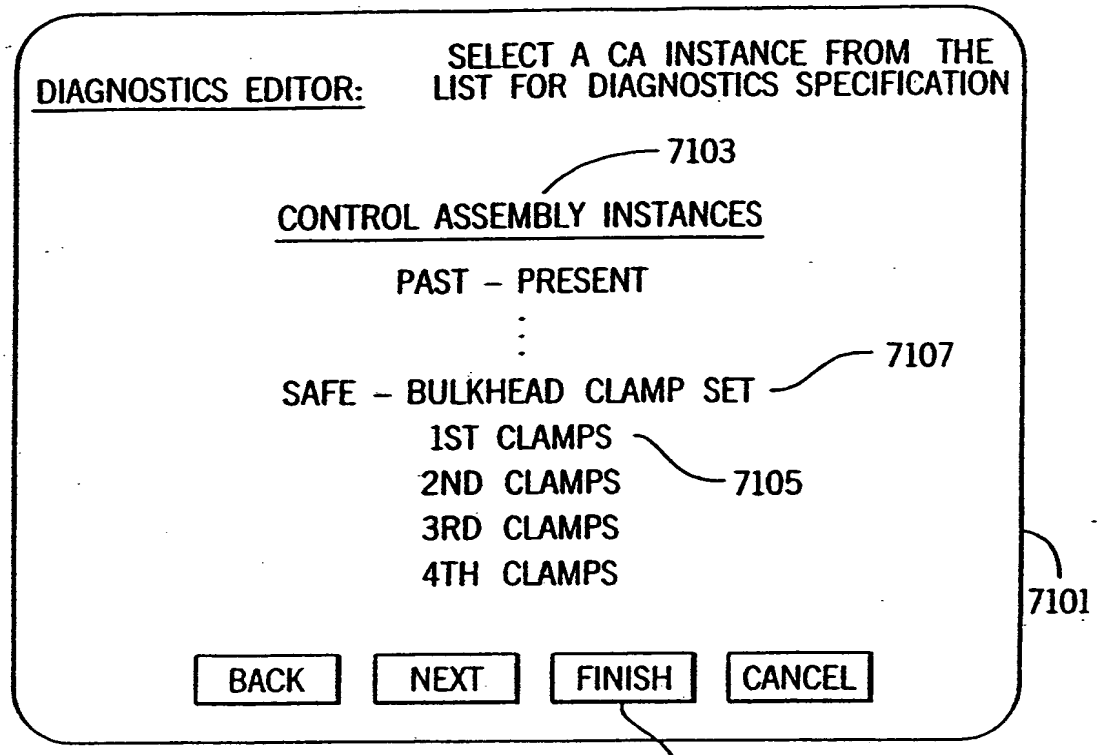


FIG. 99

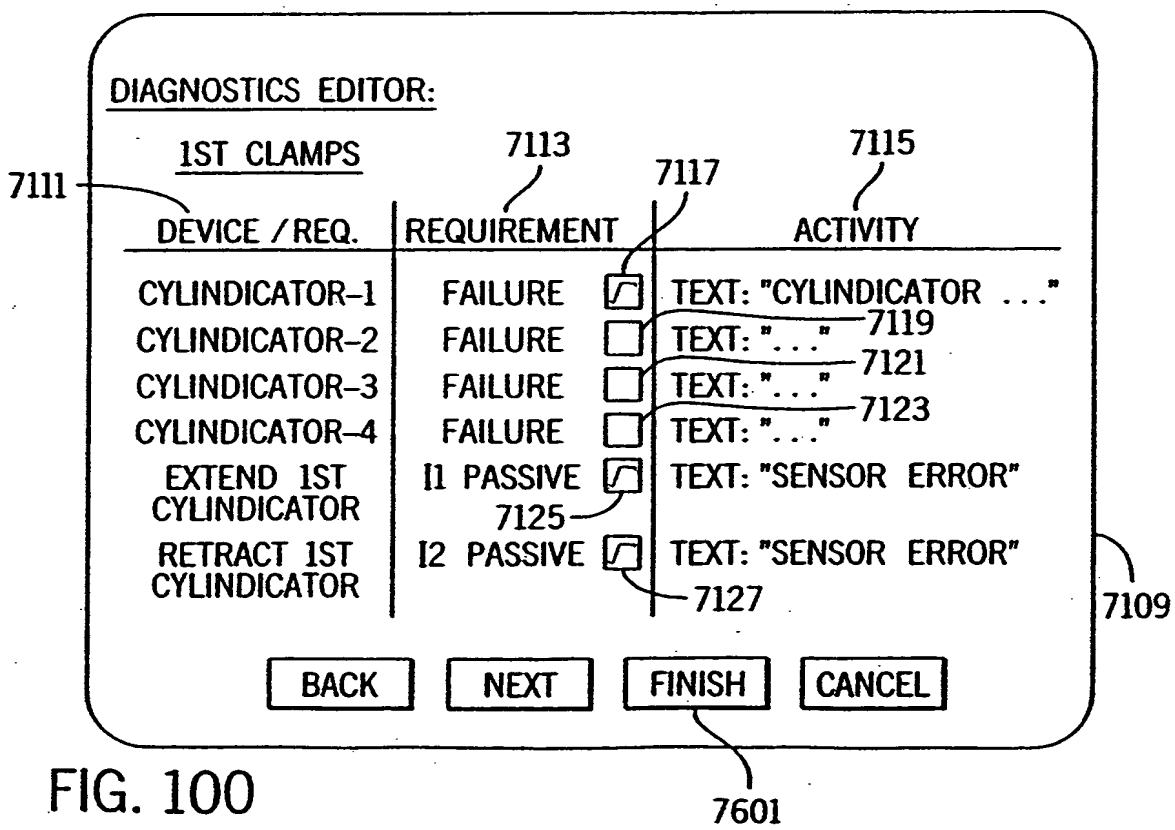


FIG. 100

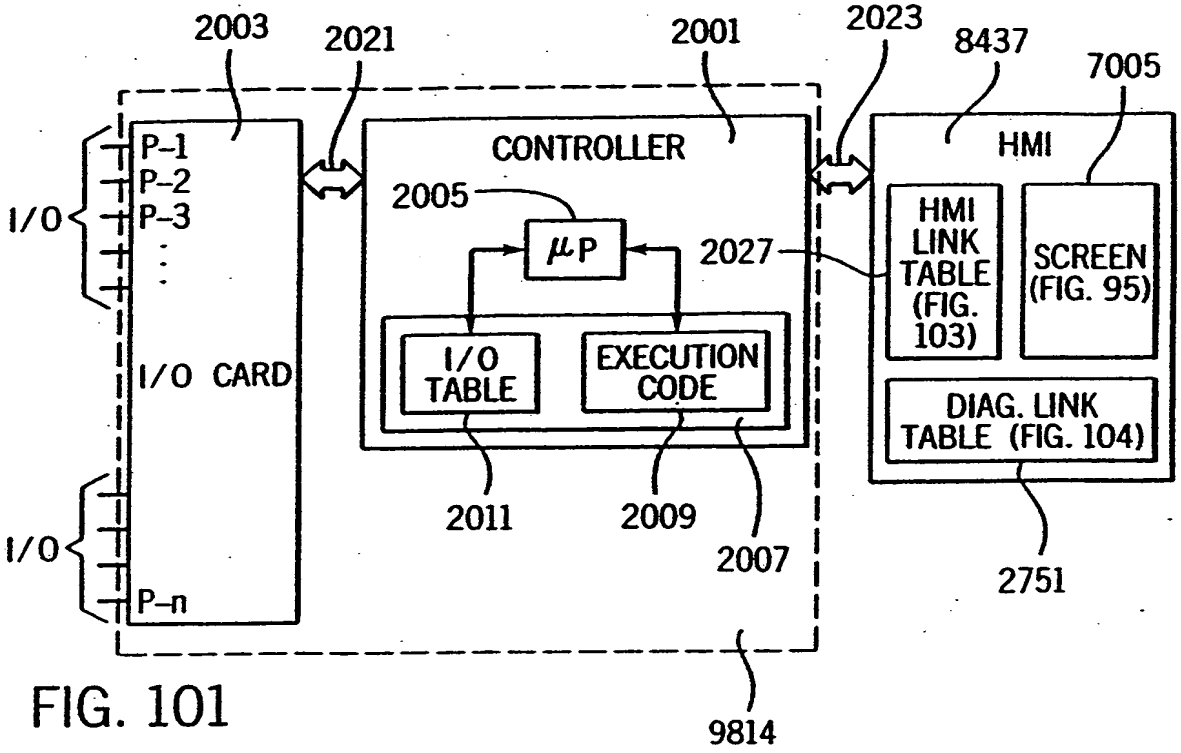


FIG. 101

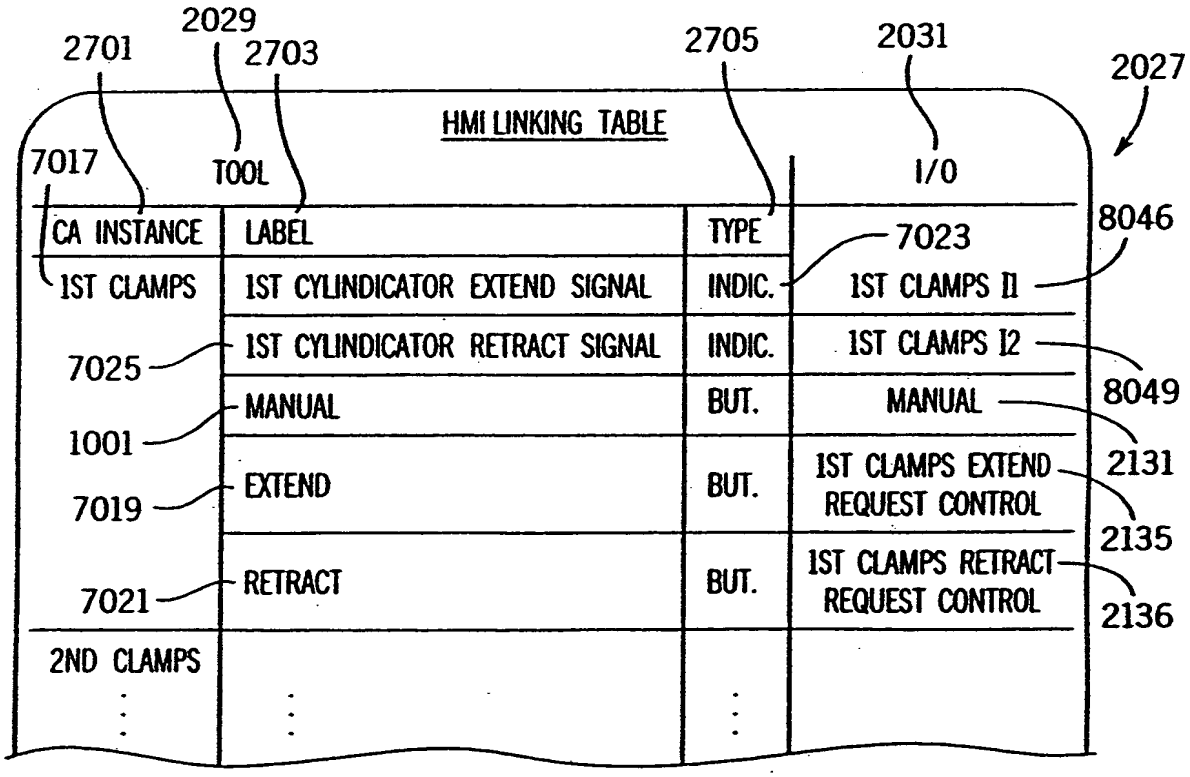


FIG. 103

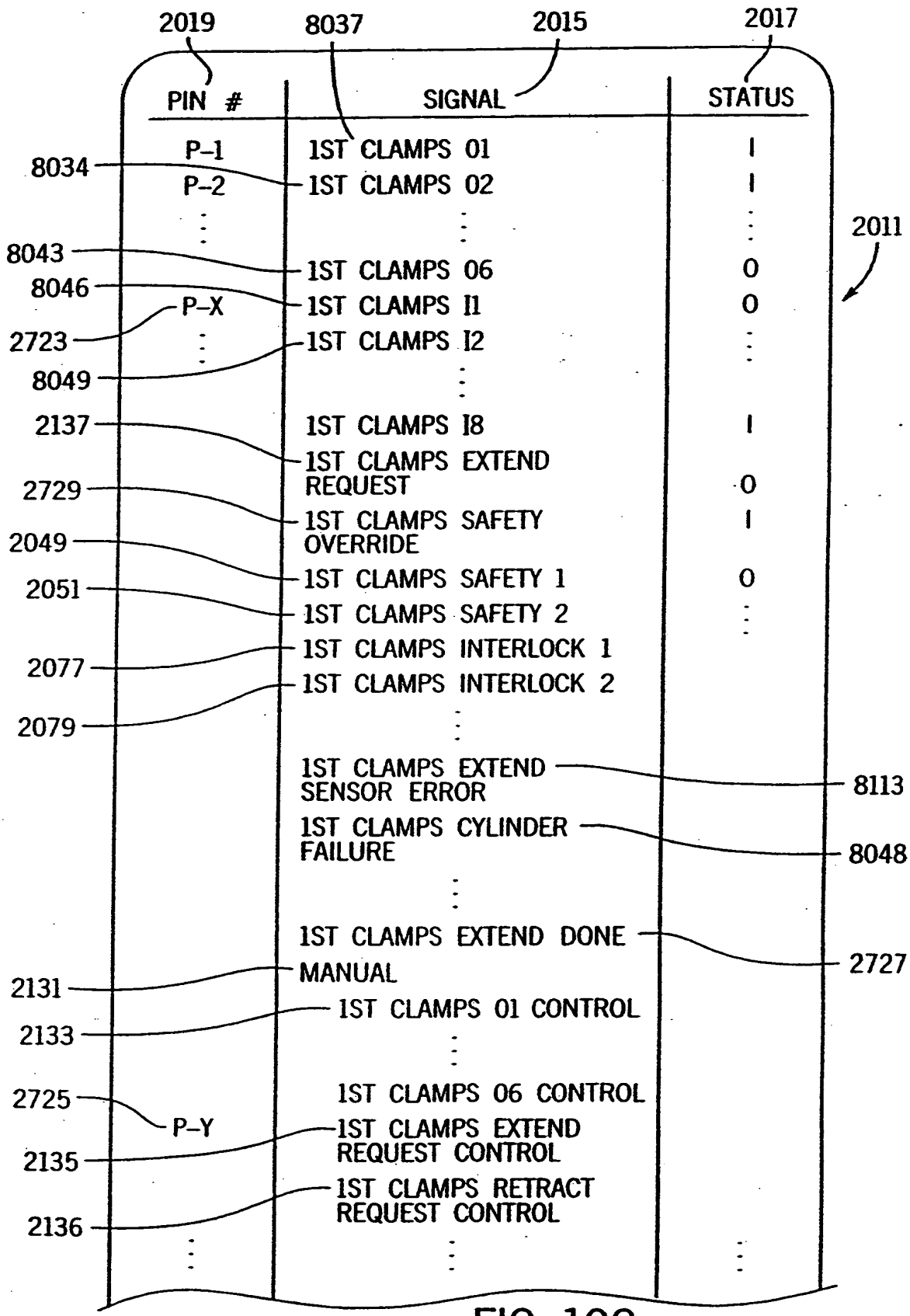

2019
8037
2015
2017
PIN #
SIGNAL
STATUS
P-1
1ST CLAMPS 01
I
8034
P-2
1ST CLAMPS 02
I
2011
8043
1ST CLAMPS 06
0
8046
P-X
1ST CLAMPS I1
0
2723
1ST CLAMPS I2
8049
2137
1ST CLAMPS I8
I
1ST CLAMPS EXTEND REQUEST
0
2729
1ST CLAMPS SAFETY OVERRIDE
I
2049
1ST CLAMPS SAFETY 1
0
2051
1ST CLAMPS SAFETY 2
1ST CLAMPS INTERLOCK 1
2077
1ST CLAMPS INTERLOCK 2
2079
1ST CLAMPS EXTEND SENSOR ERROR
8113
1ST CLAMPS CYLINDER FAILURE
8048
1ST CLAMPS EXTEND DONE
2727
2131
MANUAL
2133
1ST CLAMPS 01 CONTROL
1ST CLAMPS 06 CONTROL
2725
P-Y
1ST CLAMPS EXTEND REQUEST CONTROL
2135
1ST CLAMPS RETRACT REQUEST CONTROL
2136

FIG. 102

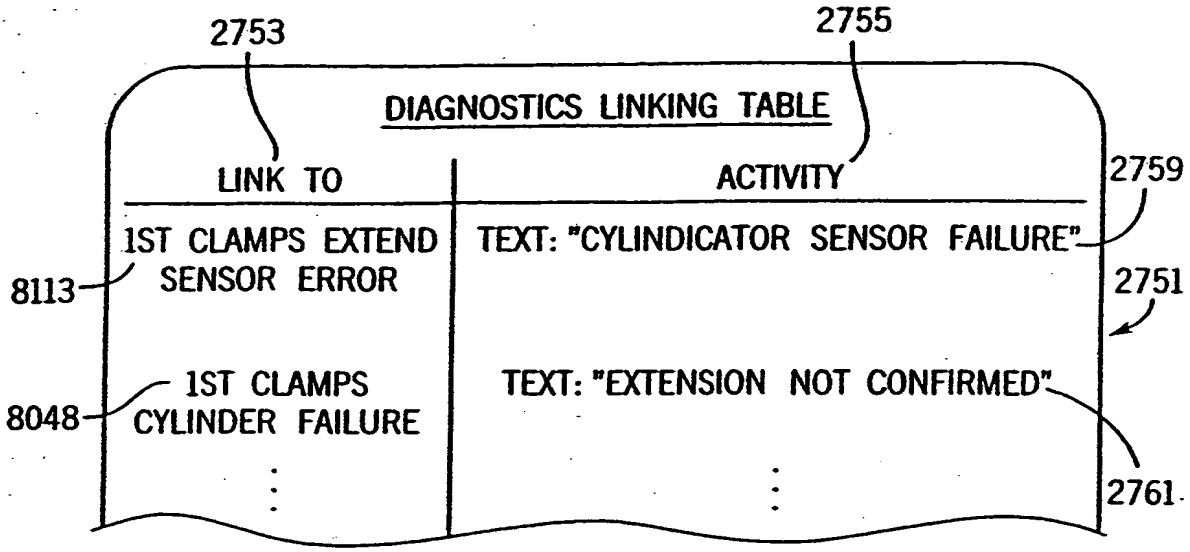


FIG. 104

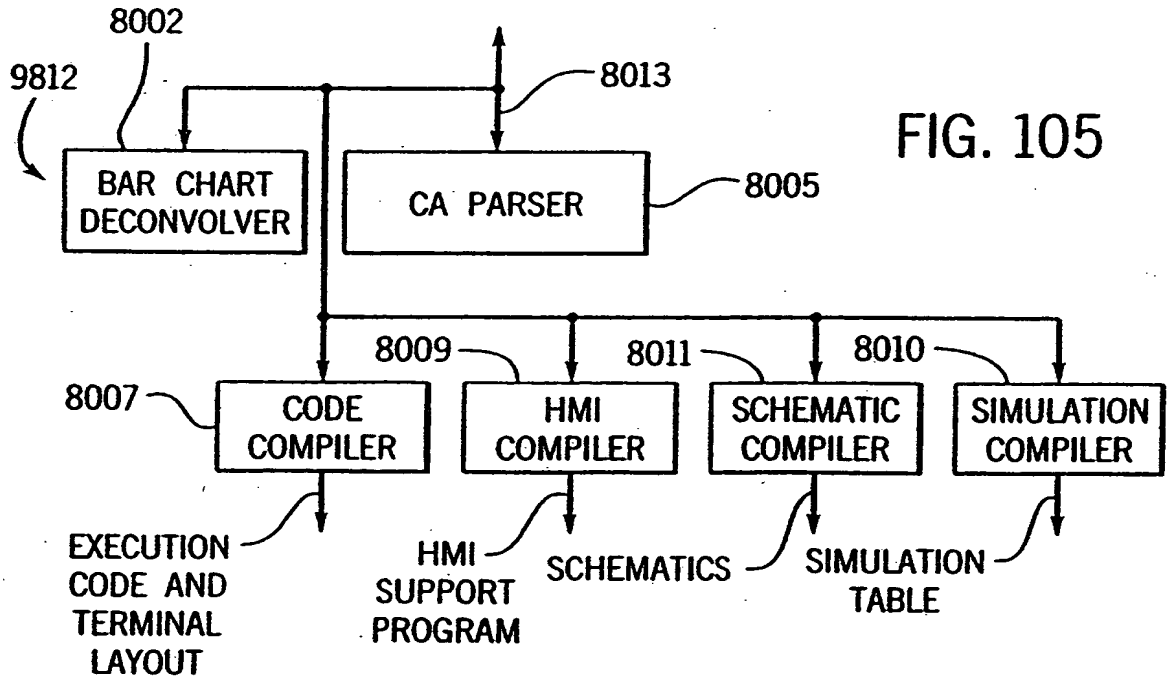


FIG. 105

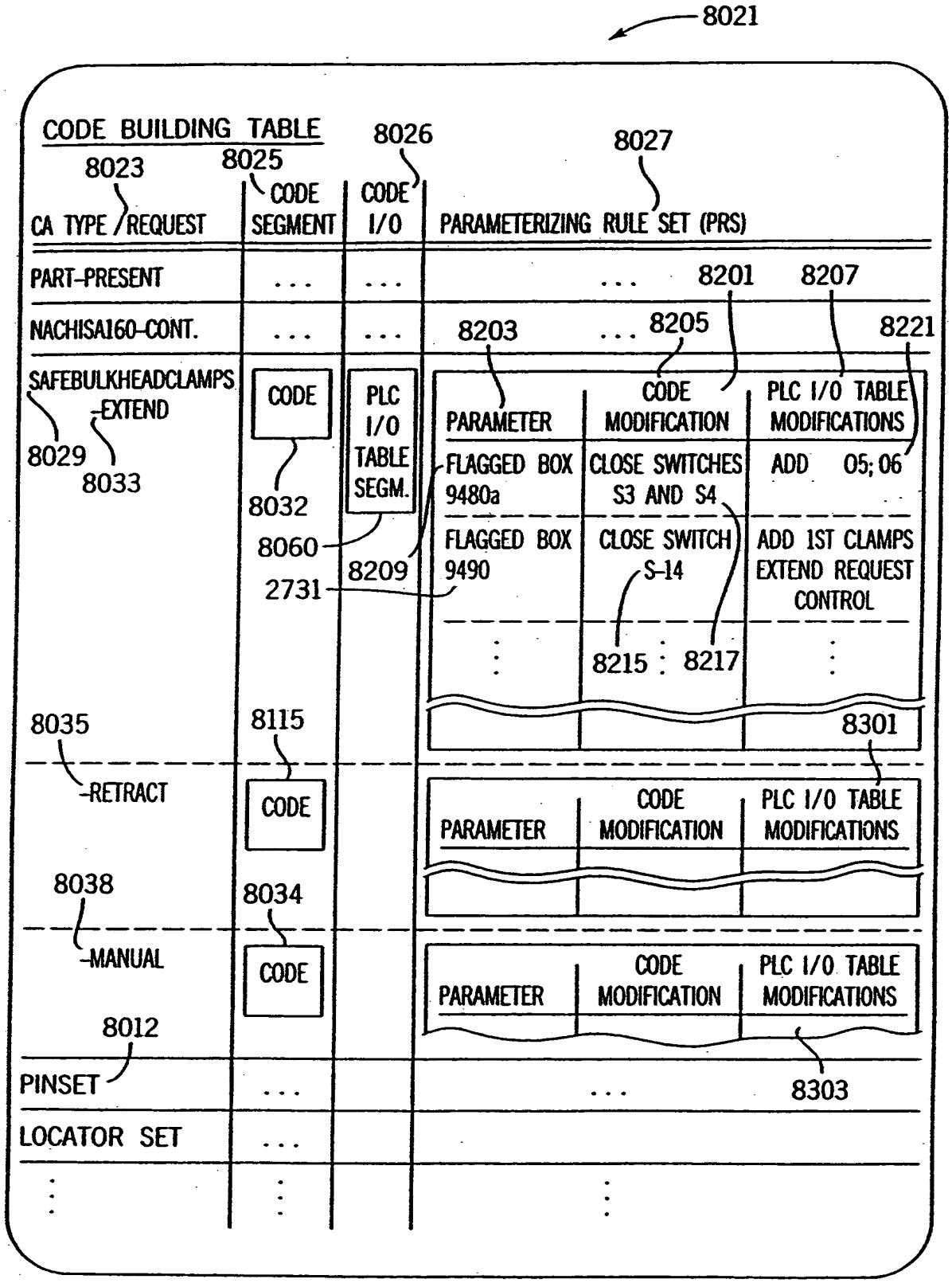

8021
CODE BUILDING TABLE
8023
8025
8026
8027
CA TYPE / REQUEST
CODE SEGMENT
CODE I/O
PARAMETERIZING RULE SET (PRS)
PART-PRESENT
NACHISA160-CONT.
SAFEBULKHEADCLAMPS -EXTEND
8029
8033
8032
8060
8209
2731
8201
8207
8203
8205
8221
PARAMETER
CODE MODIFICATION
PLC I/O TABLE MODIFICATIONS
FLAGGED BOX 9480a
CLOSE SWITCHES S3 AND S4
ADD 05; 06
FLAGGED BOX 9490
CLOSE SWITCH S-14
ADD 1ST CLAMPS EXTEND REQUEST CONTROL
8215
8217
8301
8035
8115
-RETRACT
8038
8034
-MANUAL
8012
PINSET
8303
LOCATOR SET

FIG. 106

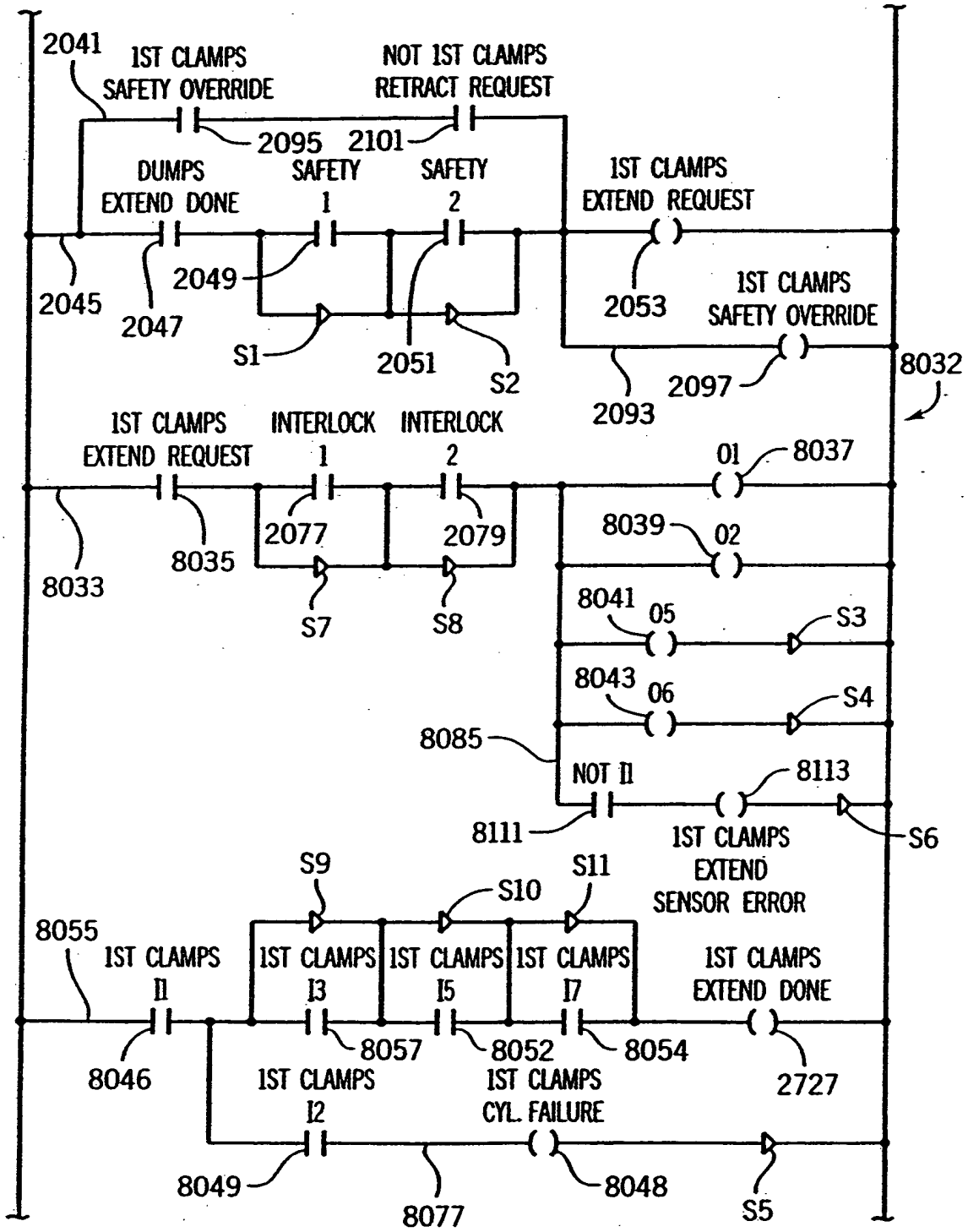

2041
1ST CLAMPS SAFETY OVERRIDE
2095
NOT 1ST CLAMPS RETRACT REQUEST
2101
DUMPS EXTEND DONE
SAFETY 1
SAFETY 2
1ST CLAMPS EXTEND REQUEST
2045
2047
2049
S1
2051
S2
2053
1ST CLAMPS SAFETY OVERRIDE
2097
2093
8032
1ST CLAMPS EXTEND REQUEST
INTERLOCK 1
INTERLOCK 2
01
8037
8033
8035
2077
2079
S7
S8
8039
02
8041
05
S3
8043
06
S4
8085
NOT I1
8113
8111
S6
1ST CLAMPS EXTEND SENSOR ERROR
S9
S10
S11
8055
1ST CLAMPS I1
1ST CLAMPS I3
1ST CLAMPS I5
1ST CLAMPS I7
1ST CLAMPS EXTEND DONE
8046
8057
8052
8054
2727
1ST CLAMPS I2
1ST CLAMPS CYL. FAILURE
8049
8077
8048
S5

FIG. 107

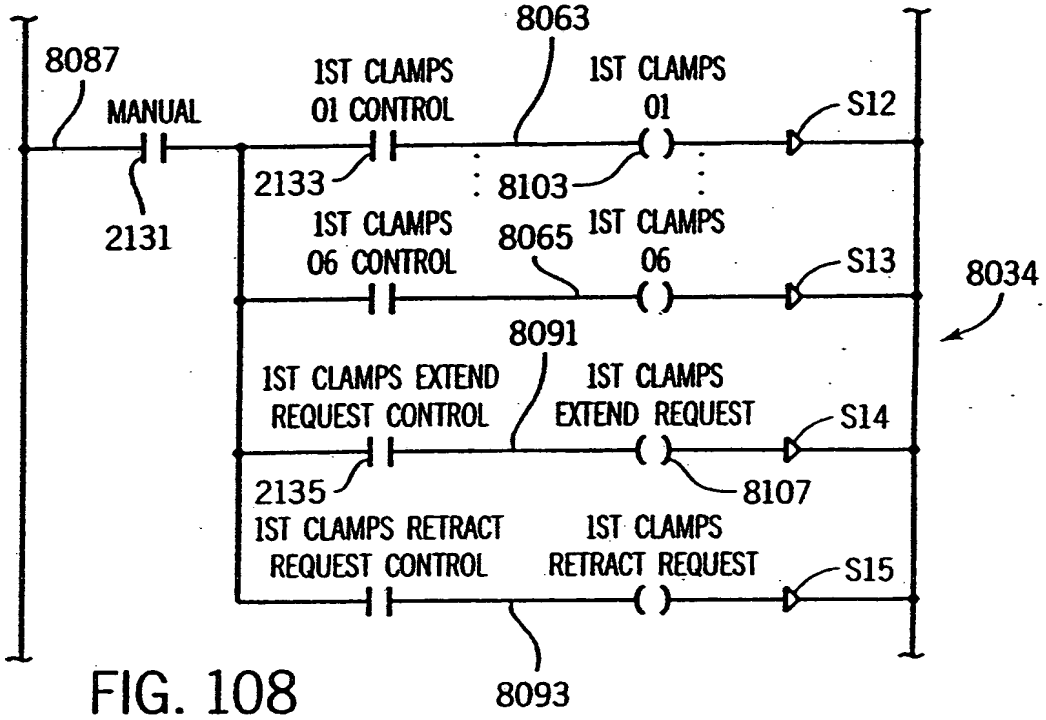

8087
MANUAL
2131
1ST CLAMPS
01 CONTROL
2133
8063
1ST CLAMPS
01
8103
S12
1ST CLAMPS
06 CONTROL
8065
1ST CLAMPS
06
S13
8034
8091
1ST CLAMPS EXTEND
REQUEST CONTROL
2135
1ST CLAMPS
EXTEND REQUEST
8107
S14
1ST CLAMPS RETRACT
REQUEST CONTROL
1ST CLAMPS
RETRACT REQUEST
S15
8093

FIG. 108

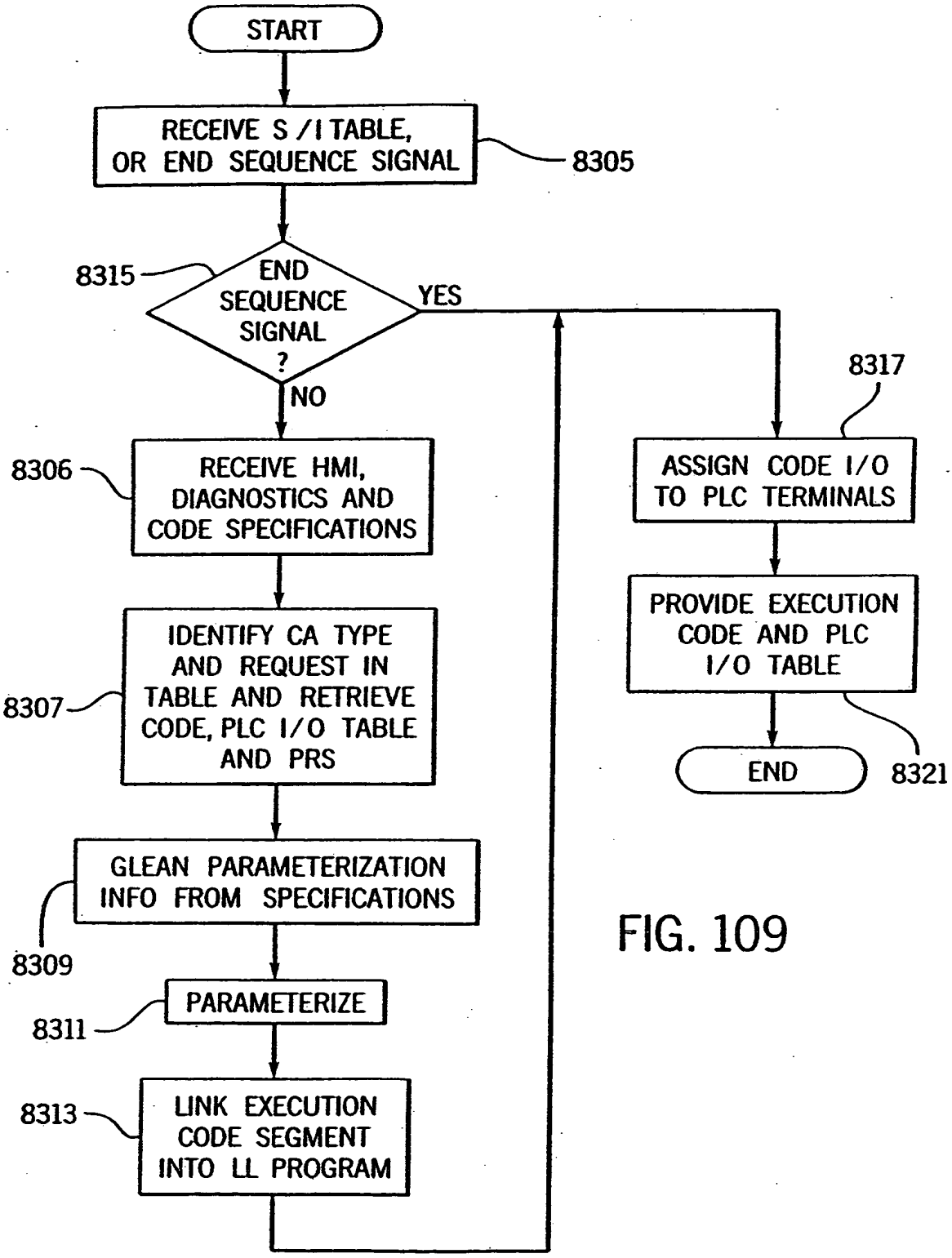

START
RECEIVE S /I TABLE, OR END SEQUENCE SIGNAL
8305
8315
END SEQUENCE SIGNAL ?
YES
NO
8317
ASSIGN CODE I/O TO PLC TERMINALS
PROVIDE EXECUTION CODE AND PLC I/O TABLE
END
8321
8306
RECEIVE HMI, DIAGNOSTICS AND CODE SPECIFICATIONS
IDENTIFY CA TYPE AND REQUEST IN TABLE AND RETRIEVE CODE, PLC I/O TABLE AND PRS
8307
GLEAN PARAMETERIZATION INFO FROM SPECIFICATIONS
8309
PARAMETERIZE
8311
LINK EXECUTION CODE SEGMENT INTO LL PROGRAM
8313

FIG. 109

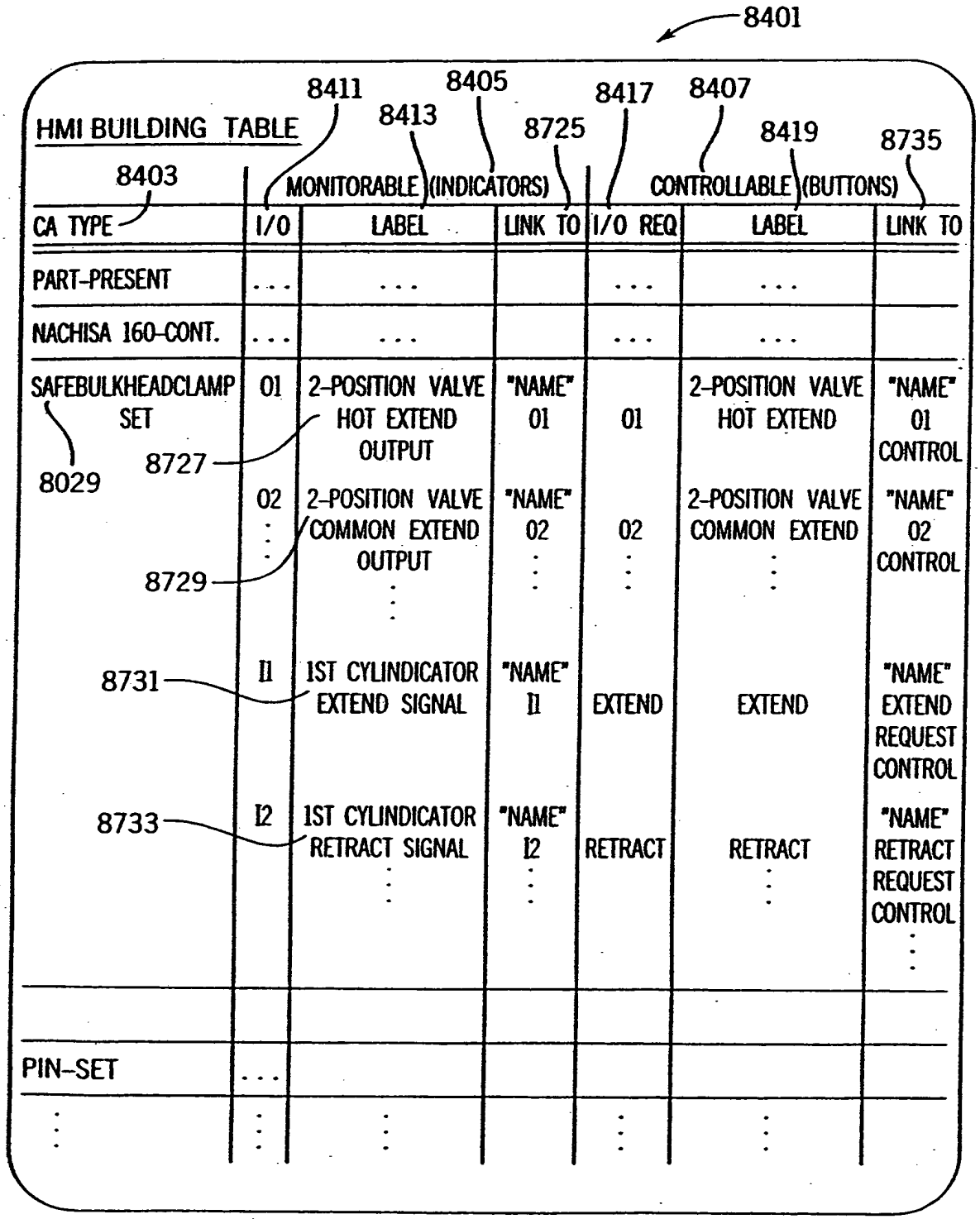

8401
HMI BUILDING TABLE
8411
8413
8405
8725
8417
8407
8419
8735
8403
MONITORABLE (INDICATORS)
CONTROLLABLE (BUTTONS)
CA TYPE
I/O
LABEL
LINK TO
I/O REQ
LABEL
LINK TO
PART-PRESENT
NACHISA 160-CONT.
SAFEBULKHEADCLAMP SET
8029
01
2-POSITION VALVE HOT EXTEND OUTPUT
8727
"NAME" 01
01
2-POSITION VALVE HOT EXTEND
"NAME" 01 CONTROL
02
2-POSITION VALVE COMMON EXTEND OUTPUT
8729
"NAME" 02
02
2-POSITION VALVE COMMON EXTEND
"NAME" 02 CONTROL
I1
8731
1ST CYLINDICATOR EXTEND SIGNAL
"NAME" I1
EXTEND
EXTEND
"NAME" EXTEND REQUEST CONTROL
I2
8733
1ST CYLINDICATOR RETRACT SIGNAL
"NAME" I2
RETRACT
RETRACT
"NAME" RETRACT REQUEST CONTROL
PIN-SET

FIG. 110

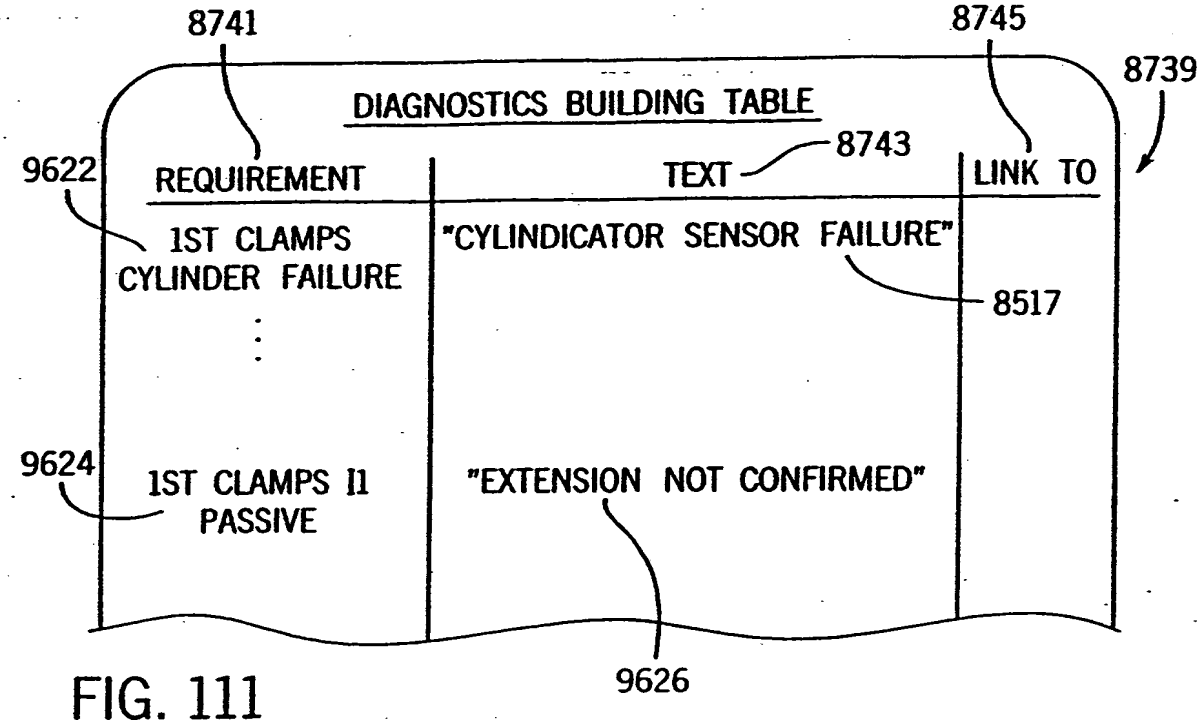


FIG. 111

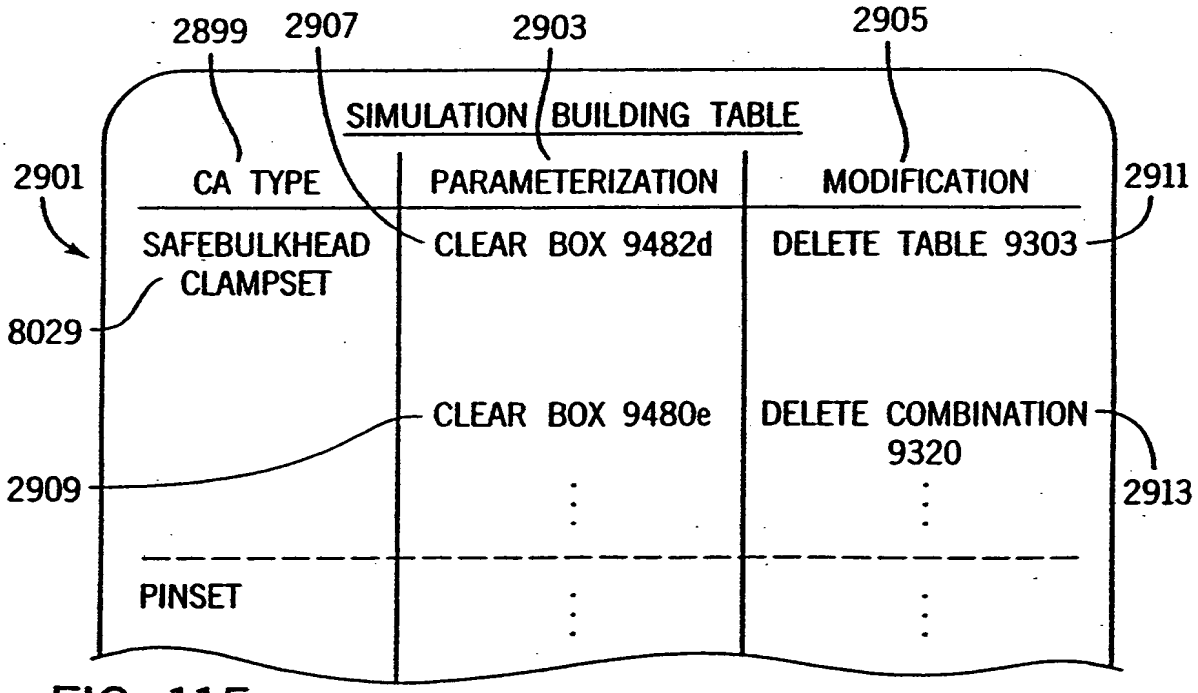


FIG. 115

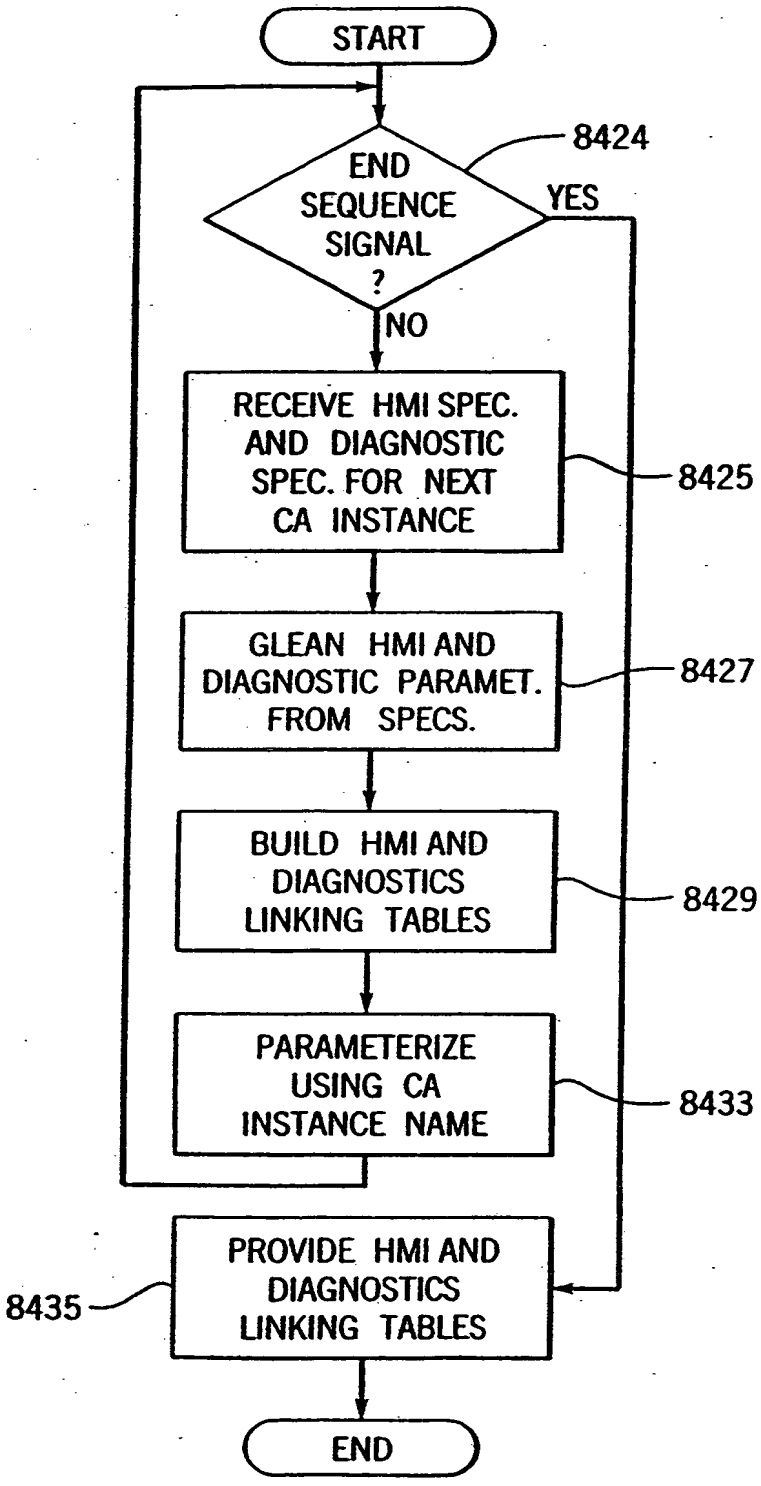

START
END SEQUENCE SIGNAL ?
8424
YES
NO
RECEIVE HMI SPEC. AND DIAGNOSTIC SPEC. FOR NEXT CA INSTANCE
8425
GLEAN HMI AND DIAGNOSTIC PARAMET. FROM SPECS.
8427
BUILD HMI AND DIAGNOSTICS LINKING TABLES
8429
PARAMETERIZE USING CA INSTANCE NAME
8433
PROVIDE HMI AND DIAGNOSTICS LINKING TABLES
8435
END

FIG. 112

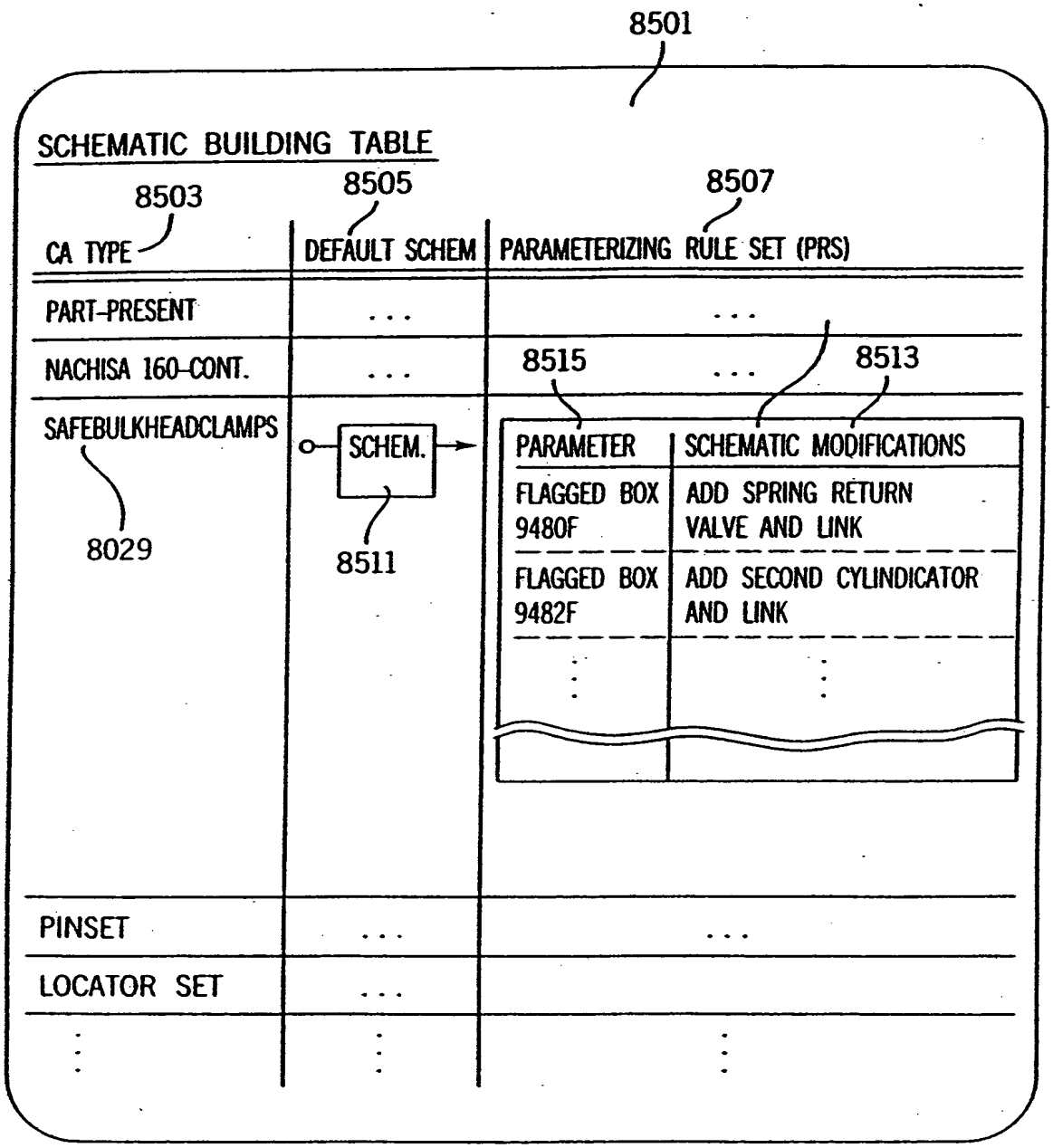

8501
SCHEMATIC BUILDING TABLE
8503
8505
8507
CA TYPE
DEFAULT SCHEM
PARAMETERIZING RULE SET (PRS)
PART-PRESENT
NACHISA 160-CONT.
8515
8513
SAFEBULKHEADCLAMPS
SCHEM.
PARAMETER
SCHEMATIC MODIFICATIONS
FLAGGED BOX 9480F
ADD SPRING RETURN VALVE AND LINK
FLAGGED BOX 9482F
ADD SECOND CYLINDICATOR AND LINK
8029
8511
PINSET
LOCATOR SET

FIG. 113

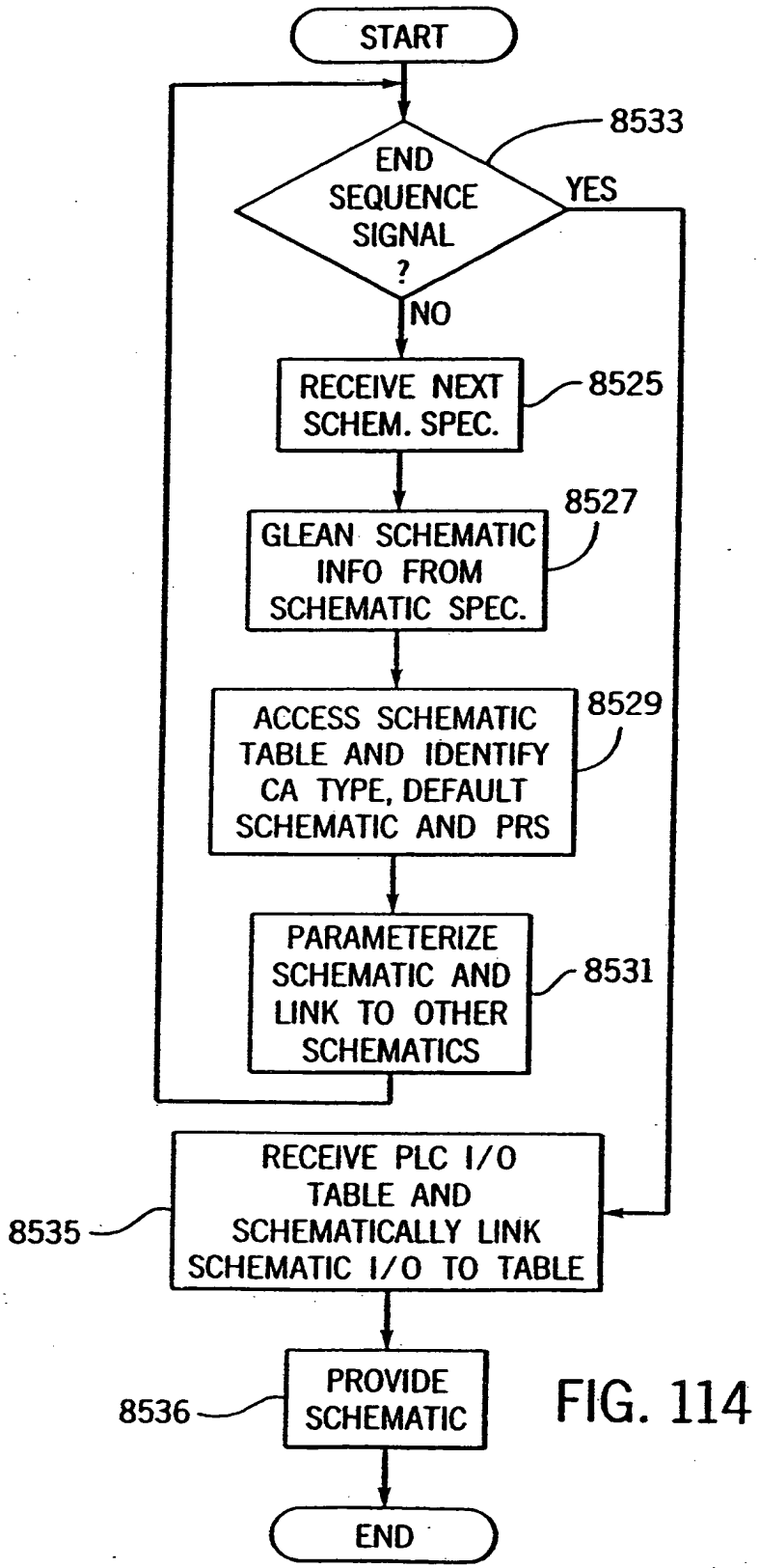

START
8533
END SEQUENCE SIGNAL ?
YES
NO
RECEIVE NEXT SCHEM. SPEC.
8525
GLEAN SCHEMATIC INFO FROM SCHEMATIC SPEC.
8527
ACCESS SCHEMATIC TABLE AND IDENTIFY CA TYPE, DEFAULT SCHEMATIC AND PRS
8529
PARAMETERIZE SCHEMATIC AND LINK TO OTHER SCHEMATICS
8531
RECEIVE PLC I/O TABLE AND SCHEMATICALLY LINK SCHEMATIC I/O TO TABLE
8535
PROVIDE SCHEMATIC
8536
END

FIG. 114

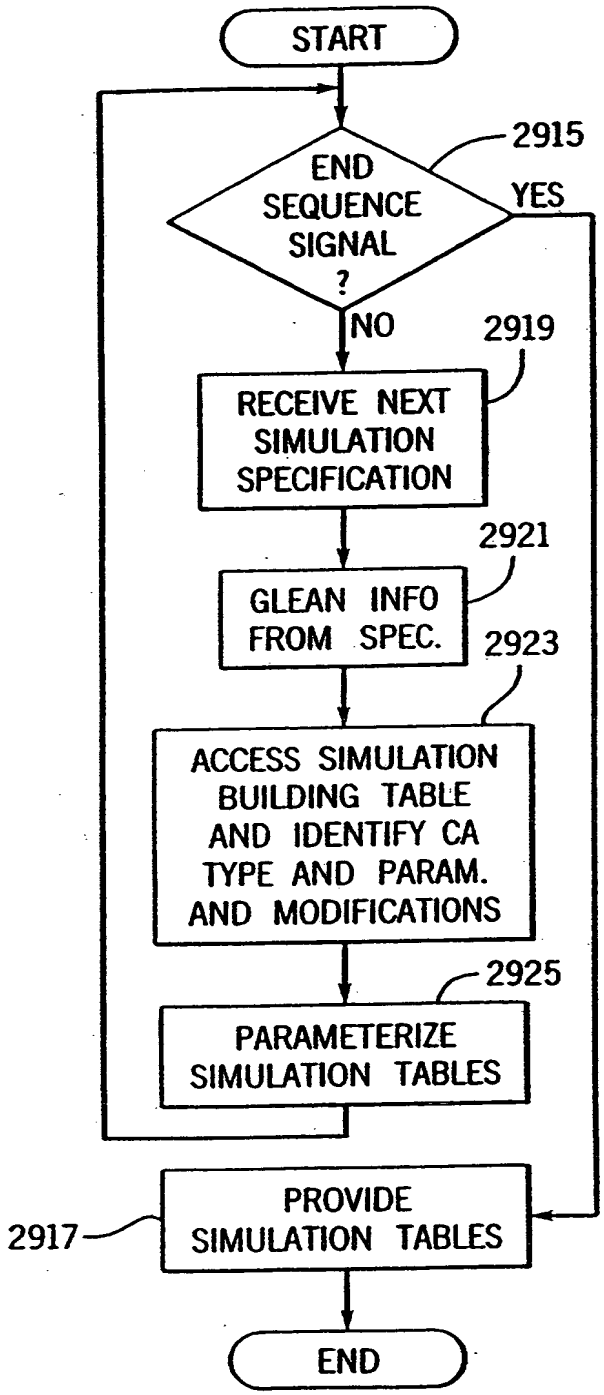
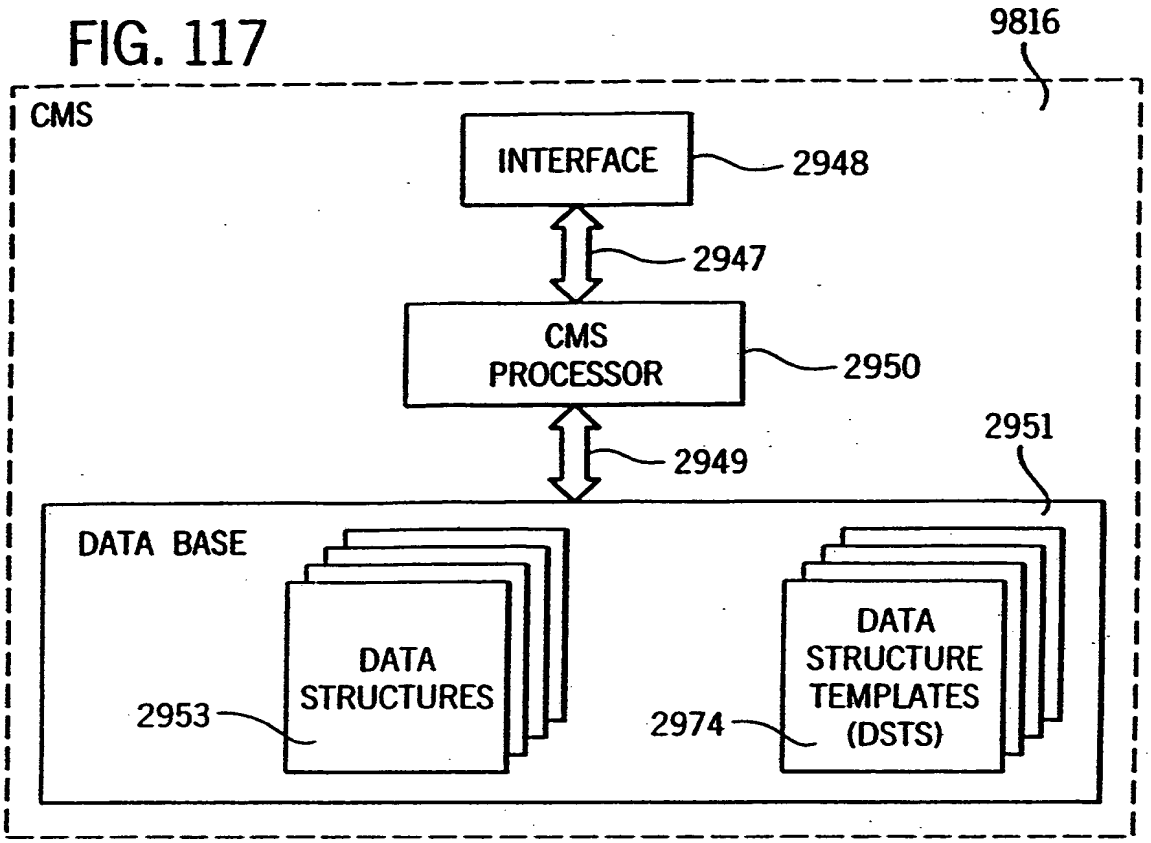

START
END SEQUENCE SIGNAL ?
2915
YES
NO
2919
RECEIVE NEXT SIMULATION SPECIFICATION
2921
GLEAN INFO FROM SPEC.
2923
ACCESS SIMULATION BUILDING TABLE AND IDENTIFY CA TYPE AND PARAM. AND MODIFICATIONS
2925
PARAMETERIZE SIMULATION TABLES
2917
PROVIDE SIMULATION TABLES
END

FIG. 116

FIG. 117



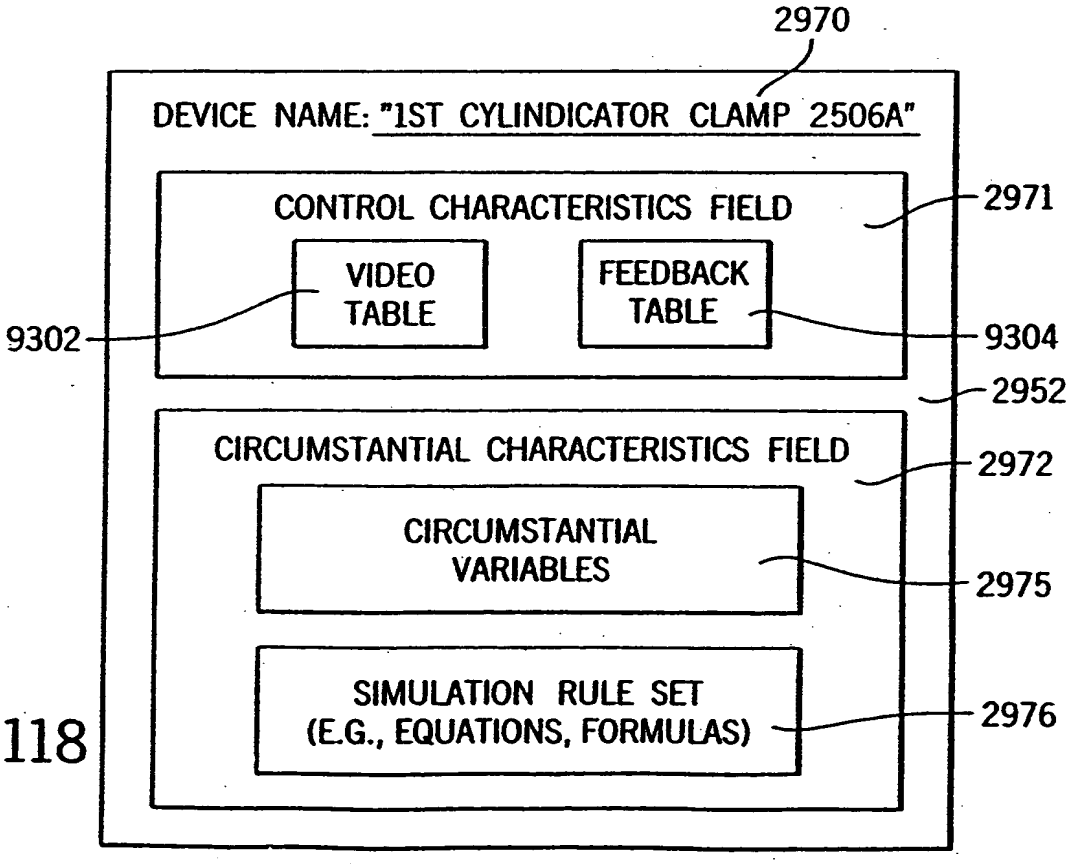


FIG. 118

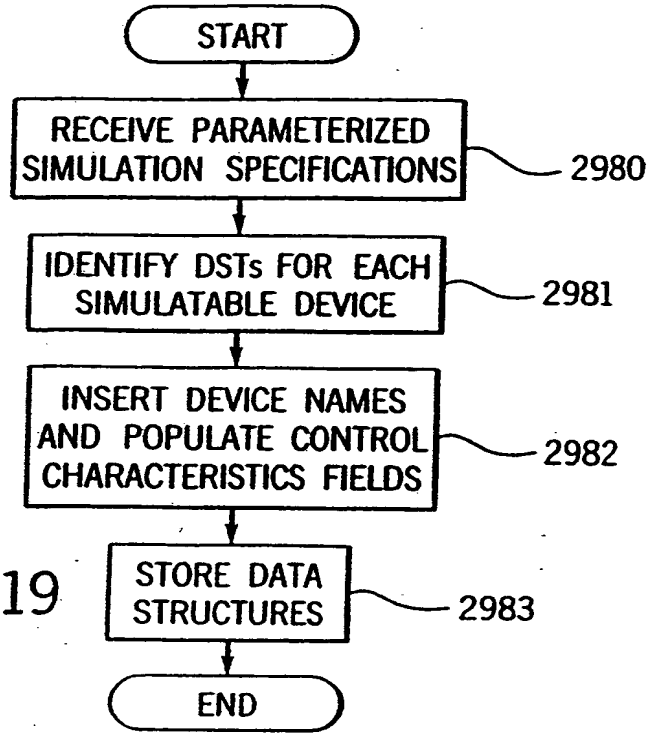


FIG. 119

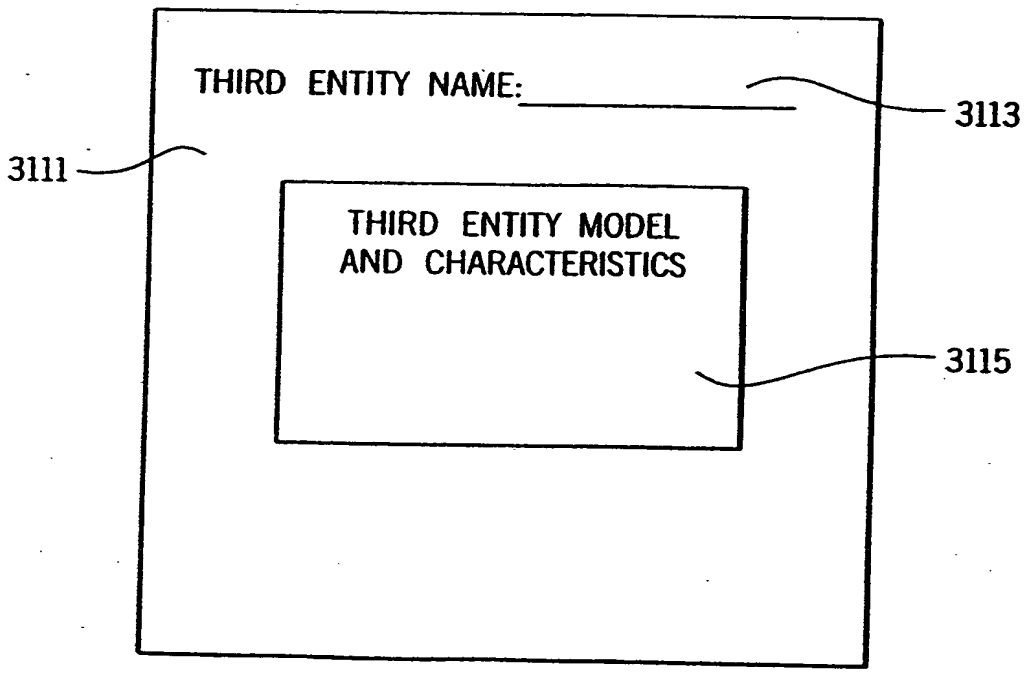


FIG. 121

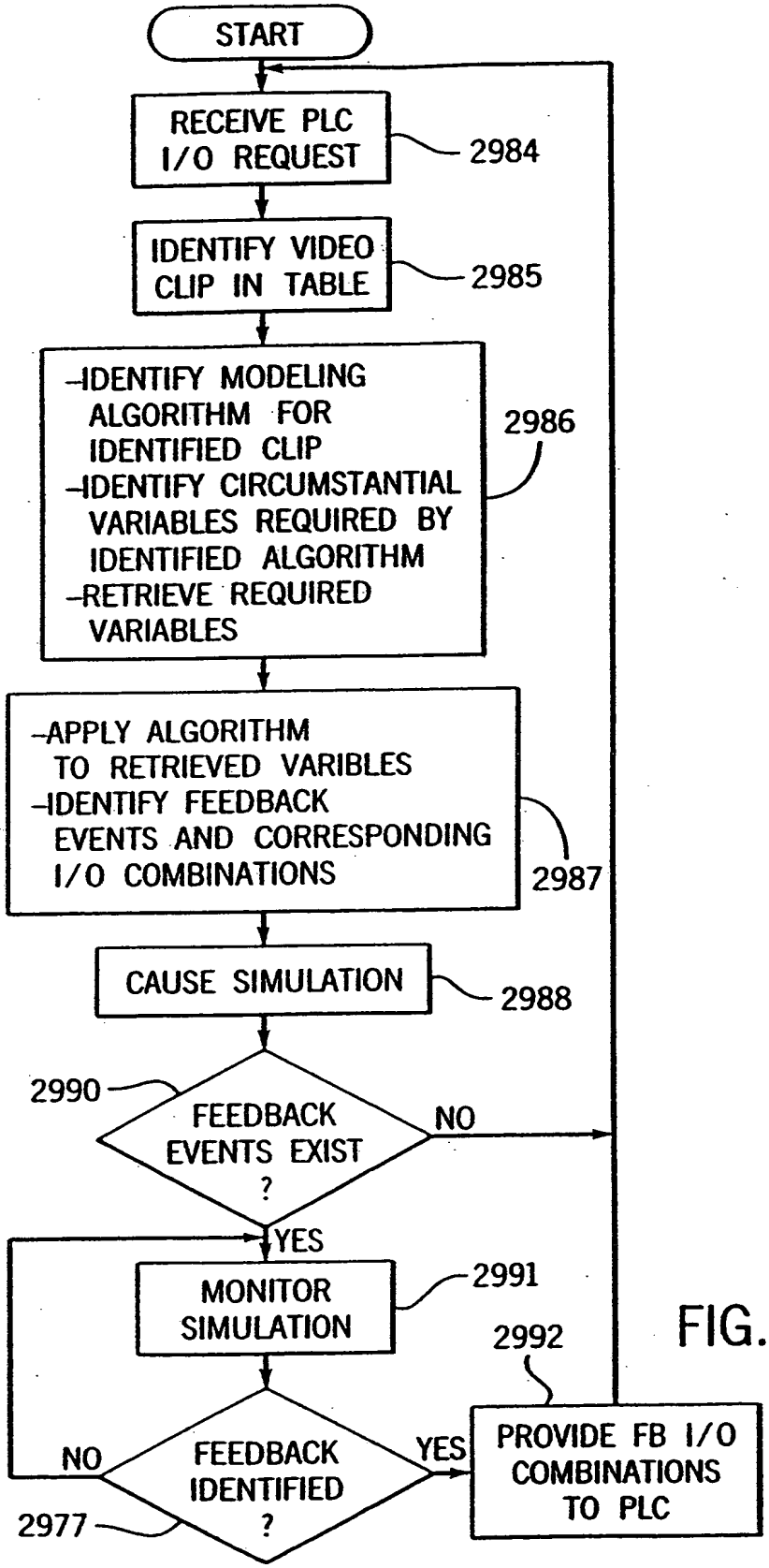

START
RECEIVE PLC I/O REQUEST
2984
IDENTIFY VIDEO CLIP IN TABLE
2985
-IDENTIFY MODELING ALGORITHM FOR IDENTIFIED CLIP
-IDENTIFY CIRCUMSTANTIAL VARIABLES REQUIRED BY IDENTIFIED ALGORITHM
-RETRIEVE REQUIRED VARIABLES
2986
-APPLY ALGORITHM TO RETRIEVED VARIBLES
-IDENTIFY FEEDBACK EVENTS AND CORRESPONDING I/O COMBINATIONS
2987
CAUSE SIMULATION
2988
2990
FEEDBACK EVENTS EXIST ?
NO
YES
MONITOR SIMULATION
2991
2992
NO
FEEDBACK IDENTIFIED ?
YES
2977
PROVIDE FB I/O COMBINATIONS TO PLC

FIG. 120

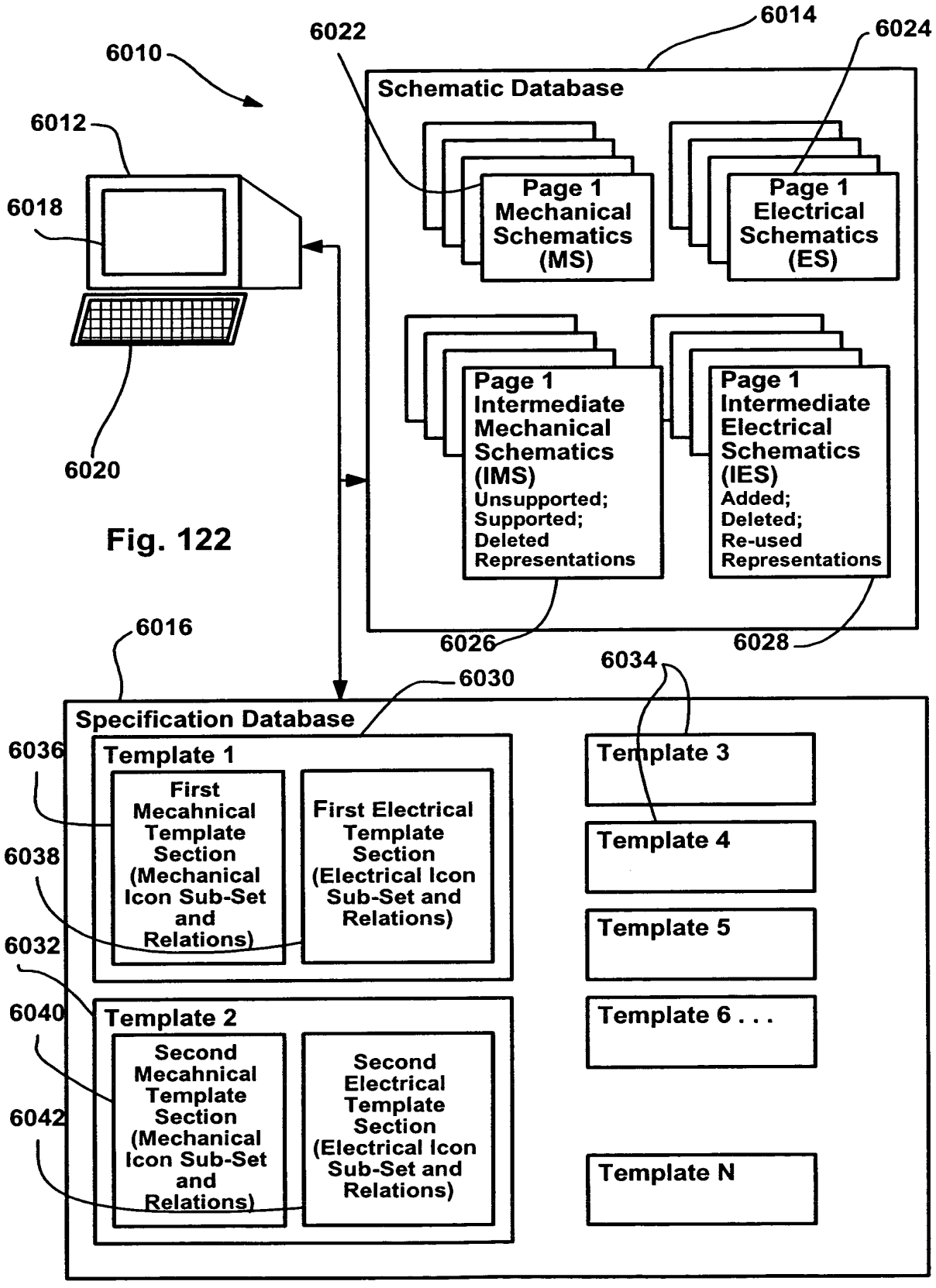

6010
6012
6018
6020
6022
6014
6024
Schematic Database
Page 1 Mechanical Schematics (MS)
Page 1 Electrical Schematics (ES)
Page 1 Intermediate Mechanical Schematics (IMS)
Unsupported; Supported; Deleted Representations
Page 1 Intermediate Electrical Schematics (IES)
Added; Deleted; Re-used Representations
6026
6028
6016
6030
6034
Specification Database
6036
Template 1
First Mecahnical Template Section (Mechanical Icon Sub-Set and Relations)
First Electrical Template Section (Electrical Icon Sub-Set and Relations)
6038
6032
6040
Template 2
Second Mecahnical Template Section (Mechanical Icon Sub-Set and Relations)
Second Electrical Template Section (Electrical Icon Sub-Set and Relations)
6042
Template 3
Template 4
Template 5
Template 6 . . .
Template N

Fig. 122

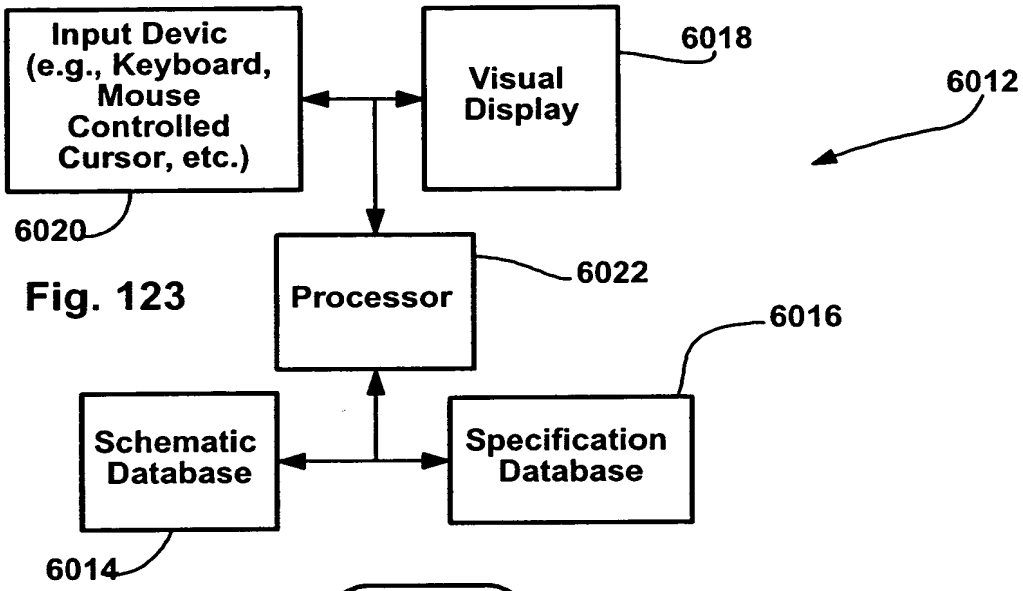


Fig. 123

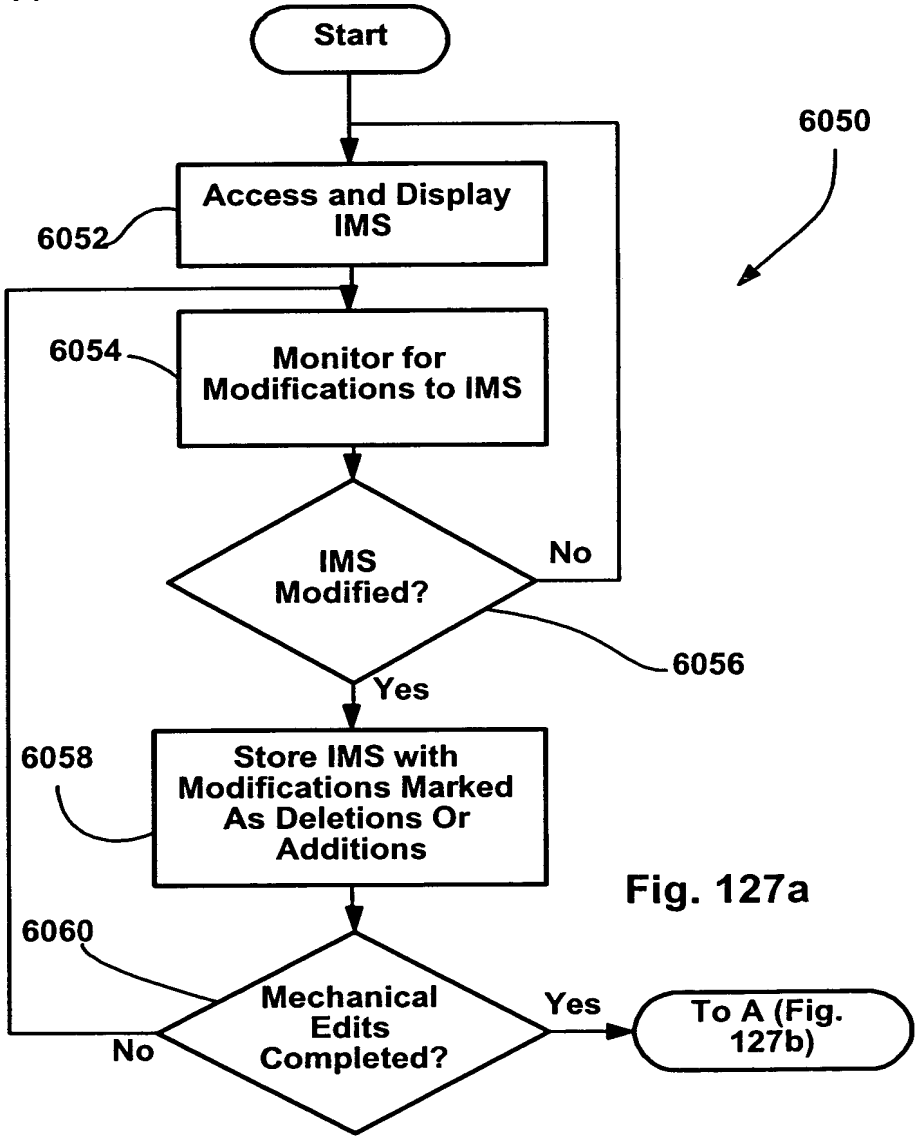


Fig. 127a

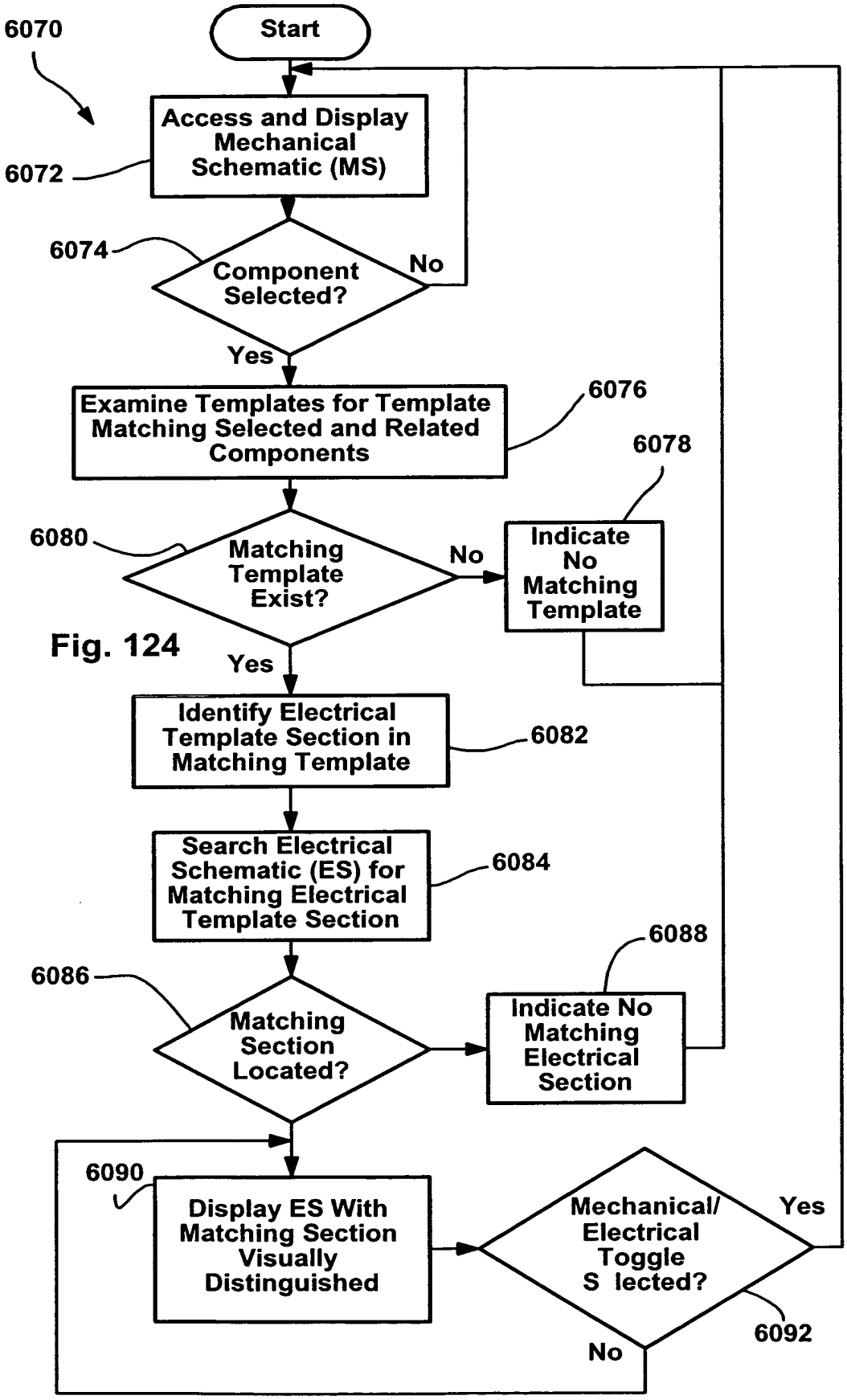

6070
Start
Access and Display Mechanical Schematic (MS)
6072
6074
Component Selected?
No
Yes
Examine Templates for Template Matching Selected and Related Components
6076
6078
6080
Matching Template Exist?
No
Indicate No Matching Template
Yes
Identify Electrical Template Section in Matching Template
6082
Search Electrical Schematic (ES) for Matching Electrical Template Section
6084
6088
6086
Matching Section Located?
Indicate No Matching Electrical Section
6090
Display ES With Matching Section Visually Distinguished
Mechanical/ Electrical Toggle S lected?
Yes
6092
No

Fig. 124

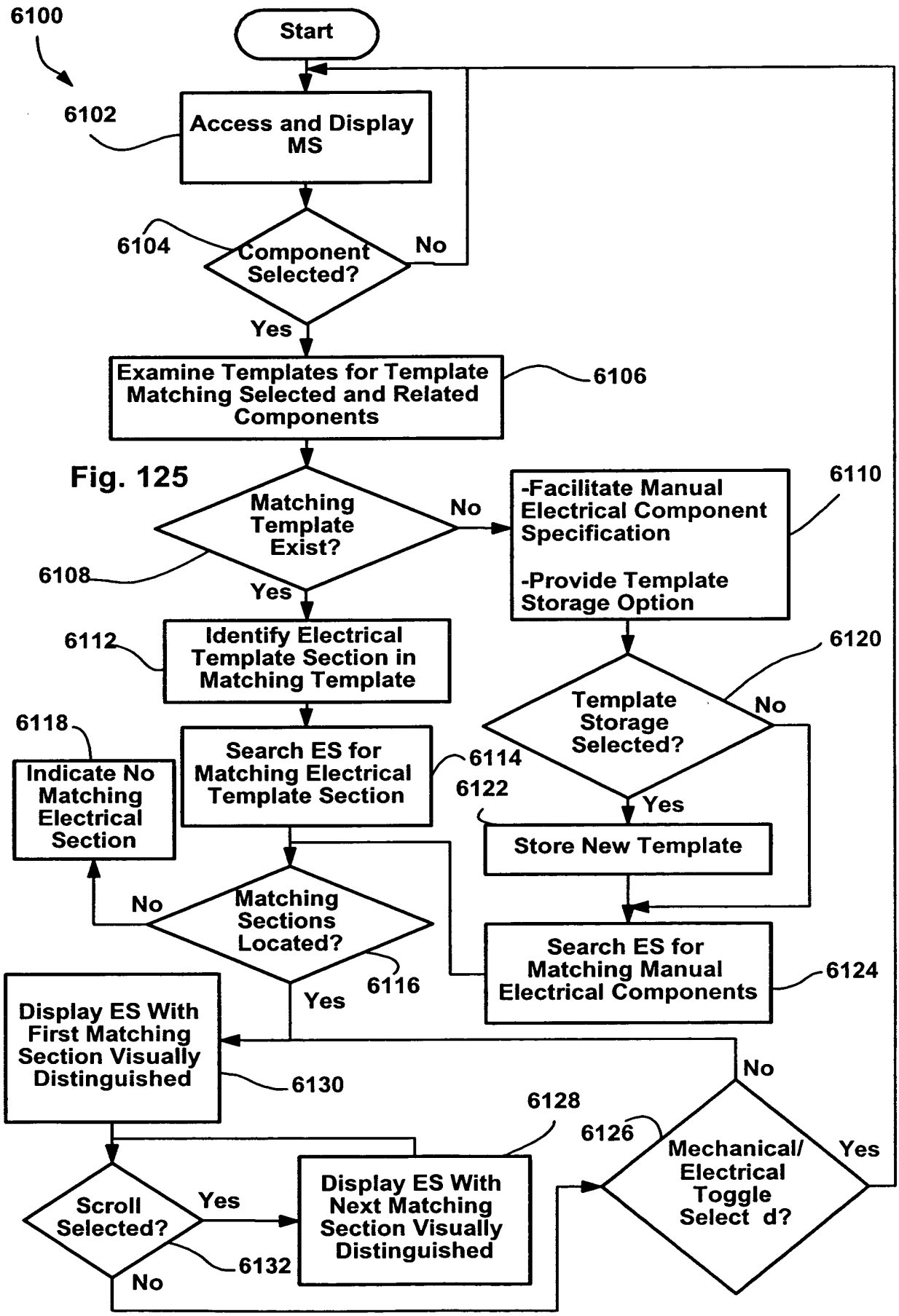

6100
Start
6102
Access and Display MS
6104
Component Selected?
No
Yes
Examine Templates for Template Matching Selected and Related Components
6106
Matching Template Exist?
No
6108
Yes
-Facilitate Manual Electrical Component Specification
-Provide Template Storage Option
6110
6112
Identify Electrical Template Section in Matching Template
6120
Template Storage Selected?
No
Yes
6118
Indicate No Matching Electrical Section
Search ES for Matching Electrical Template Section
6114
6122
Store New Template
No
Matching Sections Located?
6116
Yes
Search ES for Matching Manual Electrical Components
6124
Display ES With First Matching Section Visually Distinguished
6130
No
6128
6126
Mechanical/ Electrical Toggle Select d?
Yes
Scroll Selected?
Yes
Display ES With Next Matching Section Visually Distinguished
6132
No

Fig. 125

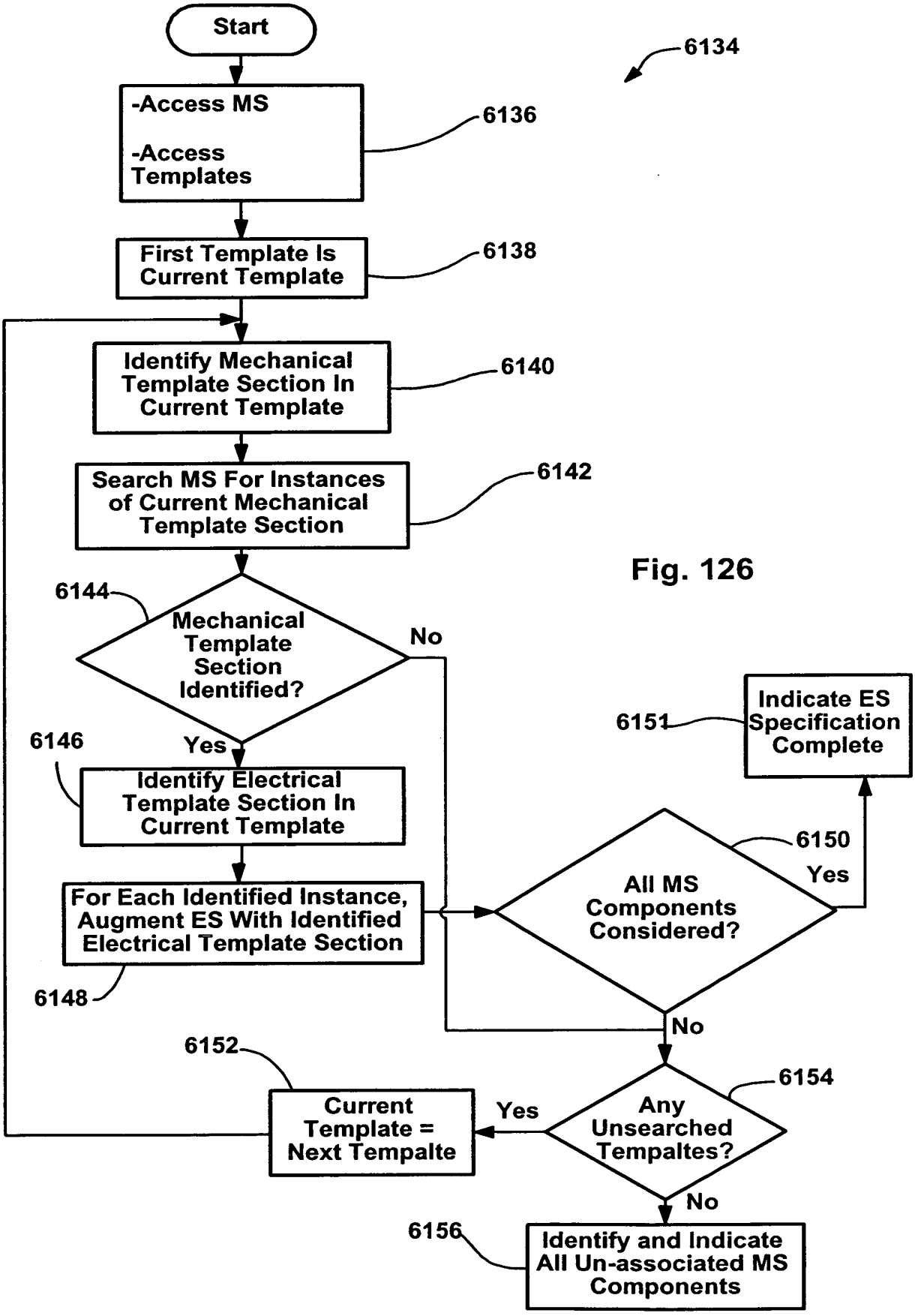

Start
6134
-Access MS
-Access Templates
6136
First Template Is Current Template
6138
Identify Mechanical Template Section In Current Template
6140
Search MS For Instances of Current Mechanical Template Section
6142
6144
Mechanical Template Section Identified?
No
Yes
6146
Identify Electrical Template Section In Current Template
For Each Identified Instance, Augment ES With Identified Electrical Template Section
6148
6150
All MS Components Considered?
Yes
6151
Indicate ES Specification Complete
No
6152
Current Template = Next Tempalte
Yes
6154
Any Unsearched Tempaltes?
No
6156
Identify and Indicate All Un-associated MS Components

Fig. 126

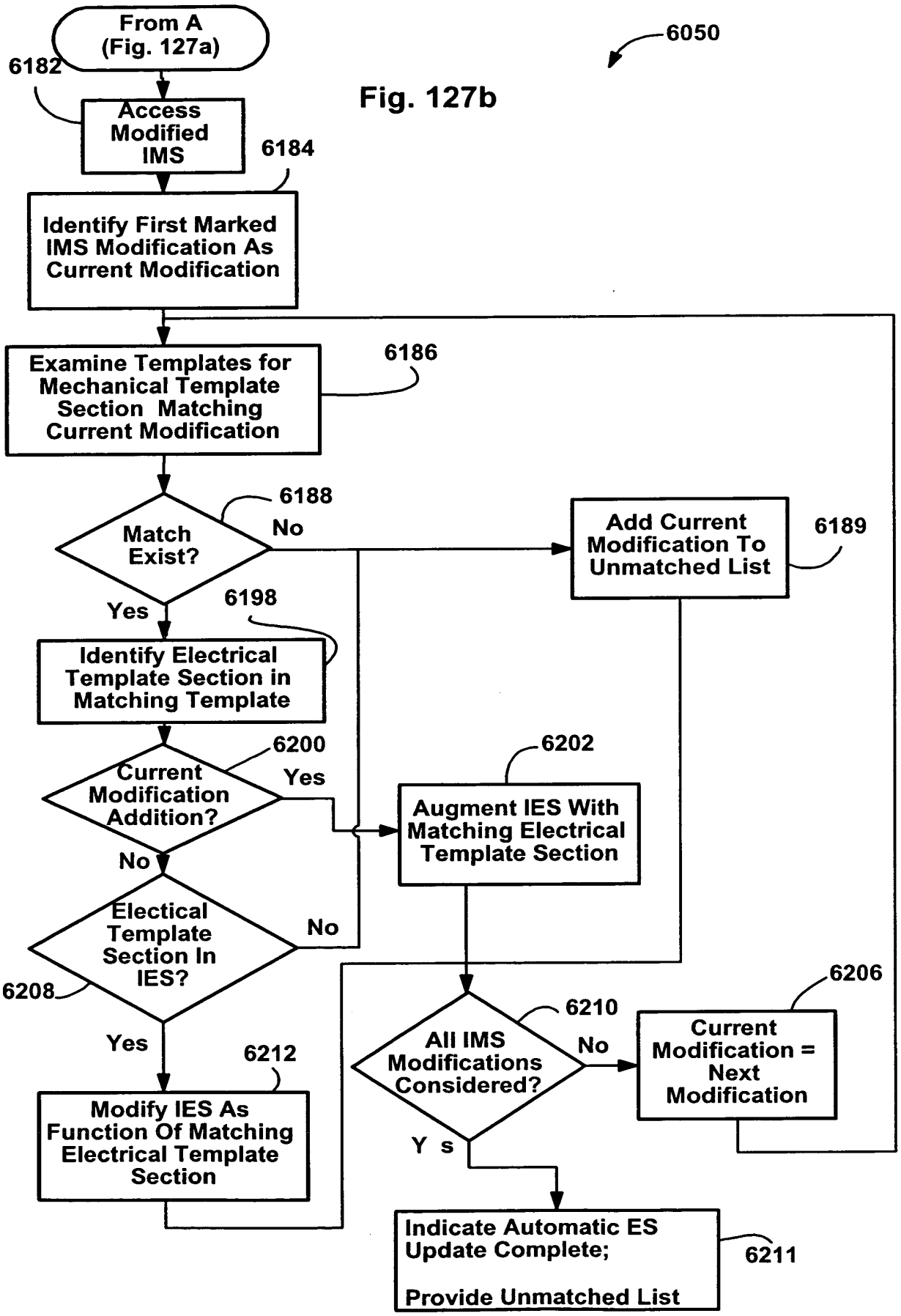

From A
(Fig. 127a)
6050
6182
Access Modified IMS
6184
Identify First Marked IMS Modification As Current Modification
Examine Templates for Mechanical Template Section Matching Current Modification
6186
6188
Match Exist?
No
Add Current Modification To Unmatched List
6189
Yes
6198
Identify Electrical Template Section in Matching Template
6200
Current Modification Addition?
Yes
6202
Augment IES With Matching Electrical Template Section
No
Electical Template Section In IES?
No
6208
Yes
6212
Modify IES As Function Of Matching Electrical Template Section
6210
All IMS Modifications Considered?
No
6206
Current Modification = Next Modification
Y s
Indicate Automatic ES Update Complete;
Provide Unmatched List
6211

Fig. 127b

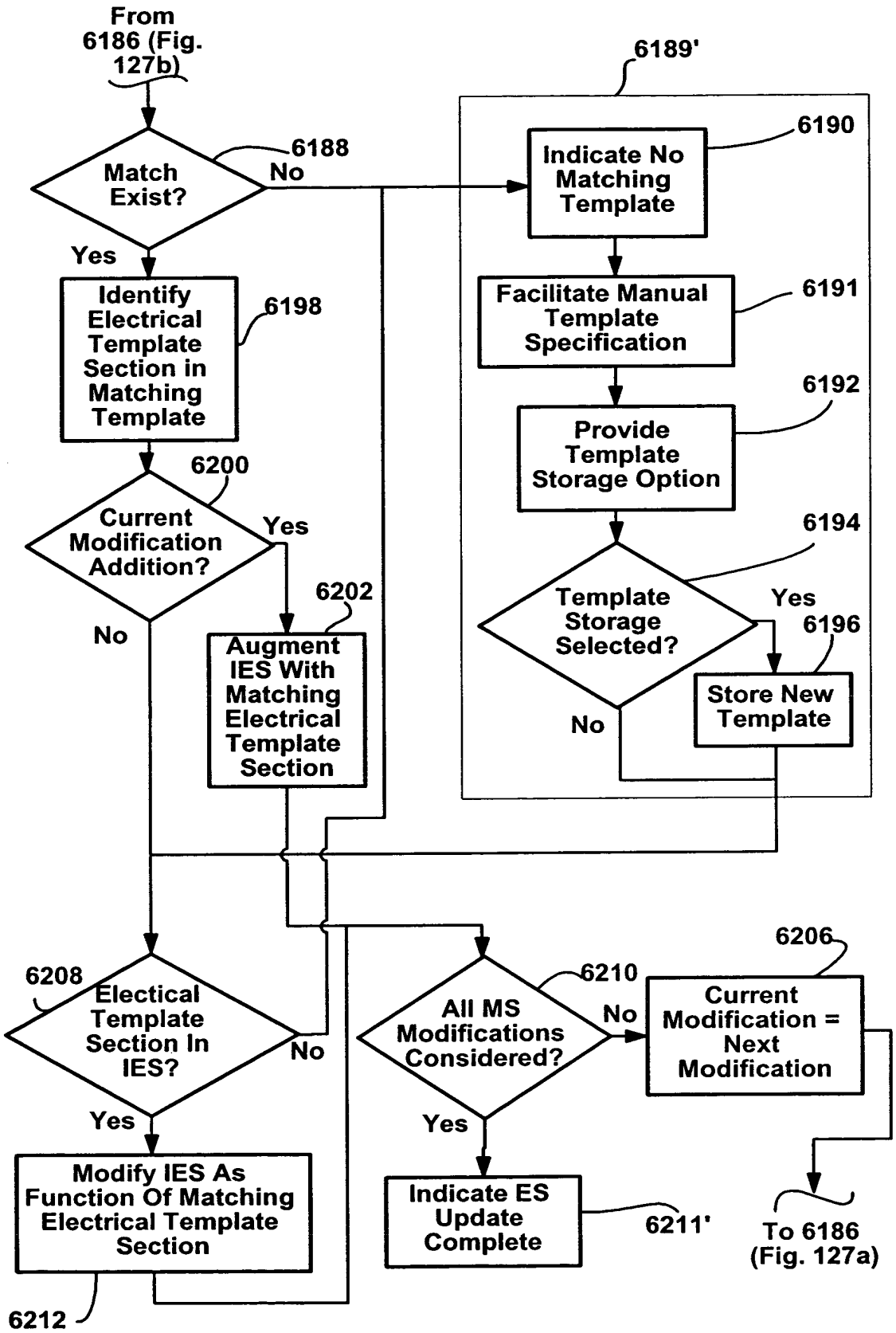

From 6186 (Fig. 127b)
Match Exist?
6188
No
Yes
Identify Electrical Template Section in Matching Template
6198
Current Modification Addition?
6200
Yes
No
Augment IES With Matching Electrical Template Section
6202
6189'
Indicate No Matching Template
6190
Facilitate Manual Template Specification
6191
Provide Template Storage Option
6192
Template Storage Selected?
6194
Yes
No
Store New Template
6196
Electical Template Section In IES?
6208
No
Yes
Modify IES As Function Of Matching Electrical Template Section
6212
All MS Modifications Considered?
6210
No
Yes
Current Modification = Next Modification
6206
Indicate ES Update Complete
6211'
To 6186 (Fig. 127a)

Fig. 128

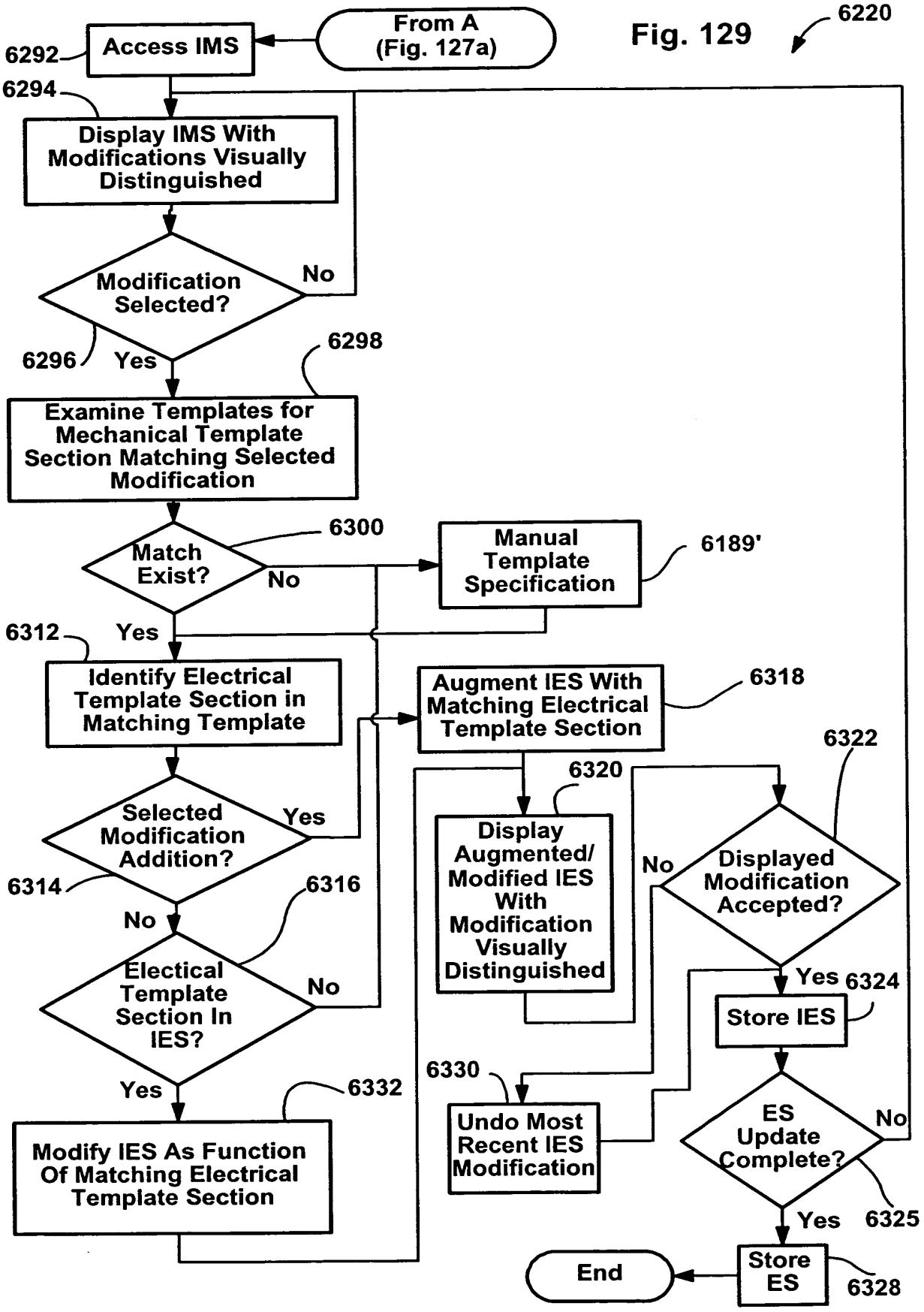


Fig. 129
6220
From A
(Fig. 127a)
6292
Access IMS
6294
Display IMS With Modifications Visually Distinguished
Modification Selected?
No
6296
Yes
6298
Examine Templates for Mechanical Template Section Matching Selected Modification
6300
Match Exist?
No
Manual Template Specification
6189'
6312
Yes
Identify Electrical Template Section in Matching Template
Augment IES With Matching Electrical Template Section
6318
6322
6320
Selected Modification Addition?
Yes
Display Augmented/ Modified IES With Modification Visually Distinguished
No
Displayed Modification Accepted?
6314
6316
No
Electical Template Section In IES?
No
Yes 6324
Store IES
6330
Undo Most Recent IES Modification
ES Update Complete?
No
Yes
6325
Yes
6332
Modify IES As Function Of Matching Electrical Template Section
End
Store ES
6328

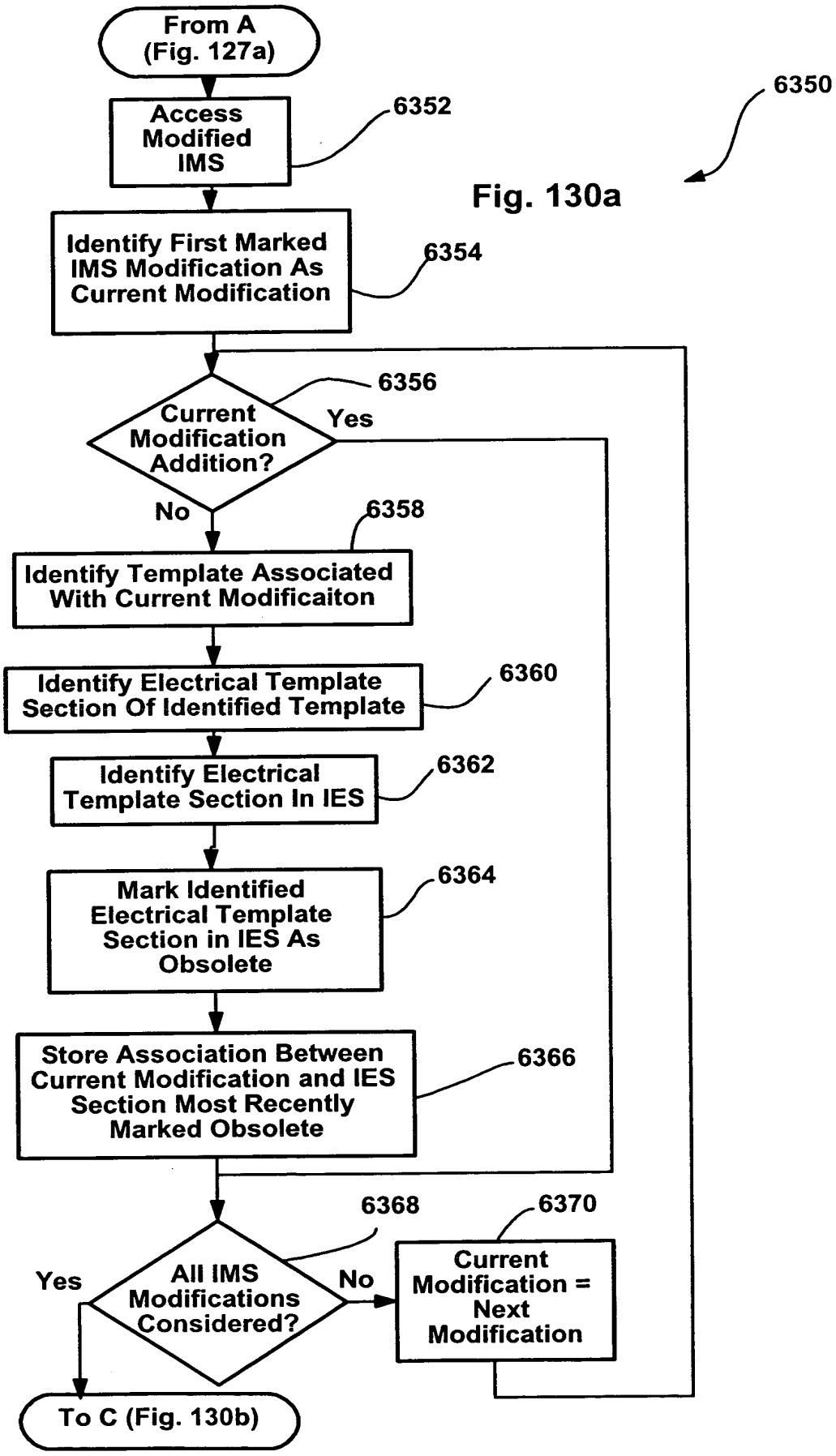

From A (Fig. 127a)
Access Modified IMS
6352
6350
Identify First Marked IMS Modification As Current Modification
6354
Current Modification Addition?
6356
Yes
No
6358
Identify Template Associated With Current Modificaiton
Identify Electrical Template Section Of Identified Template
6360
Identify Electrical Template Section In IES
6362
Mark Identified Electrical Template Section in IES As Obsolete
6364
Store Association Between Current Modification and IES Section Most Recently Marked Obsolete
6366
All IMS Modifications Considered?
6368
Yes
No
Current Modification = Next Modification
6370
To C (Fig. 130b)

Fig. 130a

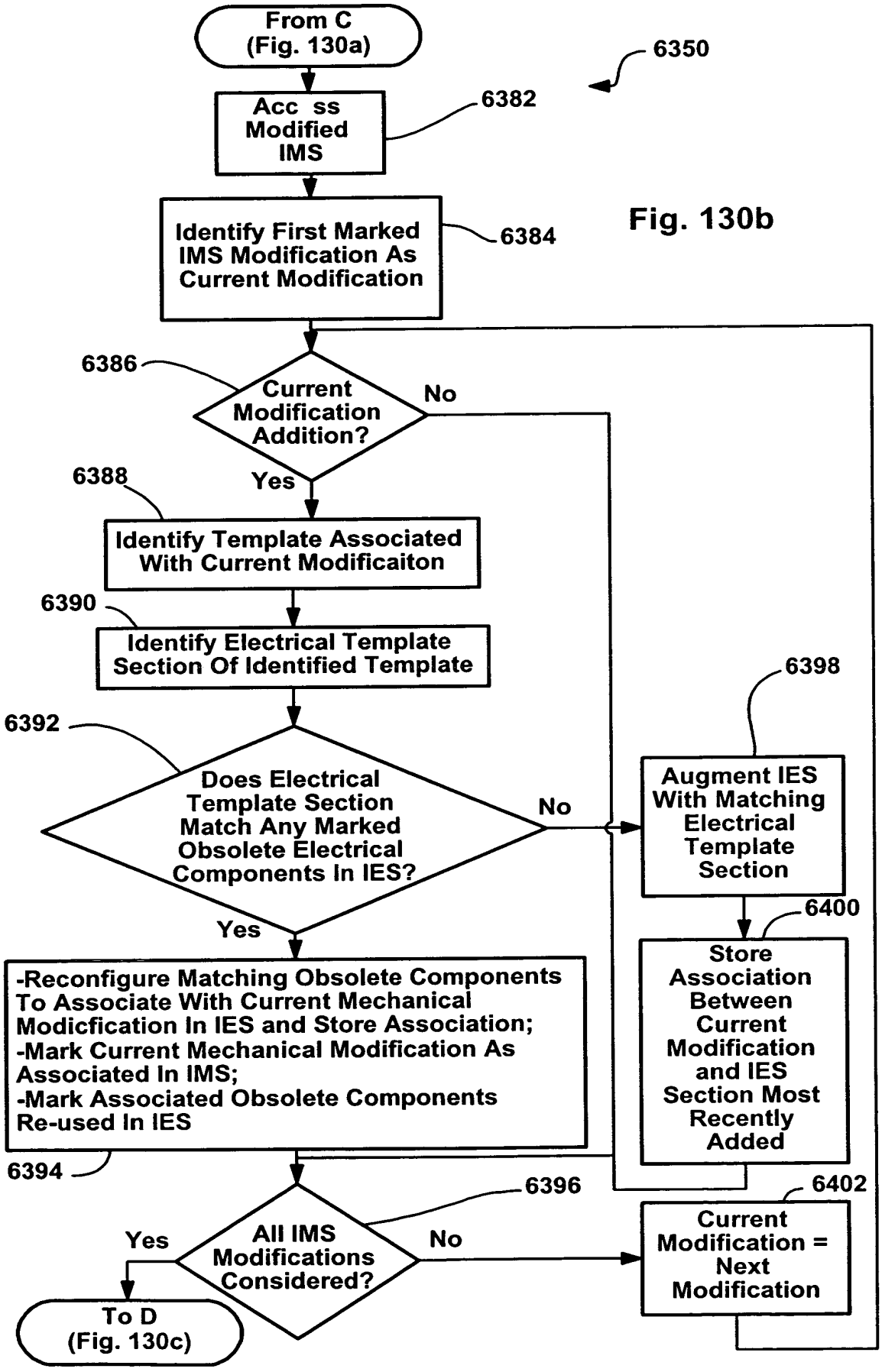

From C
(Fig. 130a)
6350
Acc ss
Modified
IMS
6382
Identify First Marked
IMS Modification As
Current Modification
6384
6386
Current
Modification
Addition?
No
Yes
6388
Identify Template Associated
With Current Modificaiton
6390
Identify Electrical Template
Section Of Identified Template
6392
Does Electrical
Template Section
Match Any Marked
Obsolete Electrical
Components In IES?
No
Yes
6398
Augment IES
With Matching
Electrical
Template
Section
6400
Store
Association
Between
Current
Modification
and IES
Section Most
Recently
Added
-Reconfigure Matching Obsolete Components
To Associate With Current Mechanical
Modicfication In IES and Store Association;
-Mark Current Mechanical Modification As
Associated In IMS;
-Mark Associated Obsolete Components
Re-used In IES
6394
6396
All IMS
Modifications
Considered?
Yes
No
6402
Current
Modification =
Next
Modification
To D
(Fig. 130c)

Fig. 130b

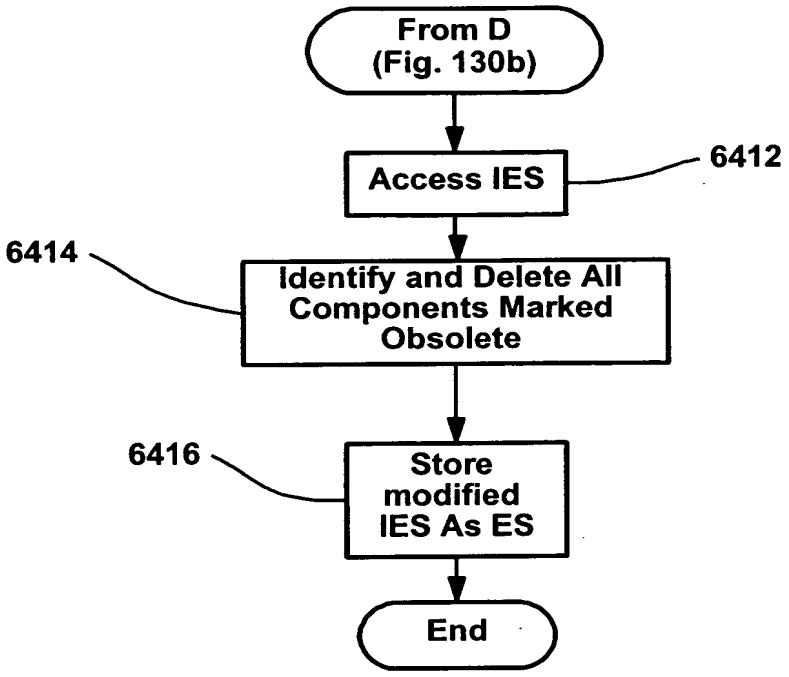
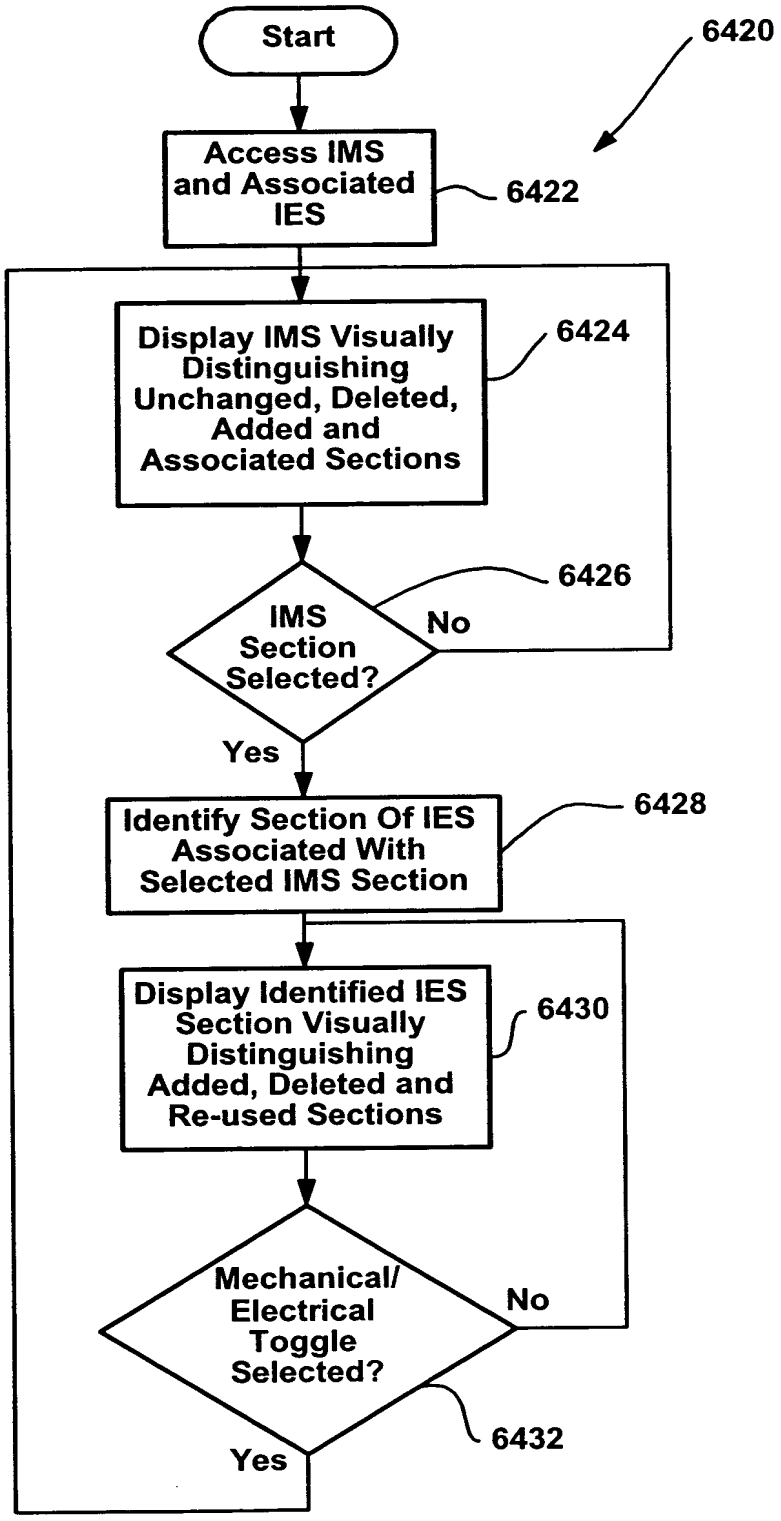

From D
(Fig. 130b)
6350
Access IES
6412
6414
Identify and Delete All Components Marked Obsolete
6416
Store modified IES As ES
End

Fig. 130c

Fig. 131


Start
6420
Access IMS and Associated IES
6422
Display IMS Visually Distinguishing Unchanged, Deleted, Added and Associated Sections
6424
IMS Section Selected?
6426
No
Yes
Identify Section Of IES Associated With Selected IMS Section
6428
Display Identified IES Section Visually Distinguishing Added, Deleted and Re-used Sections
6430
Mechanical/ Electrical Toggle Selected?
No
6432
Yes

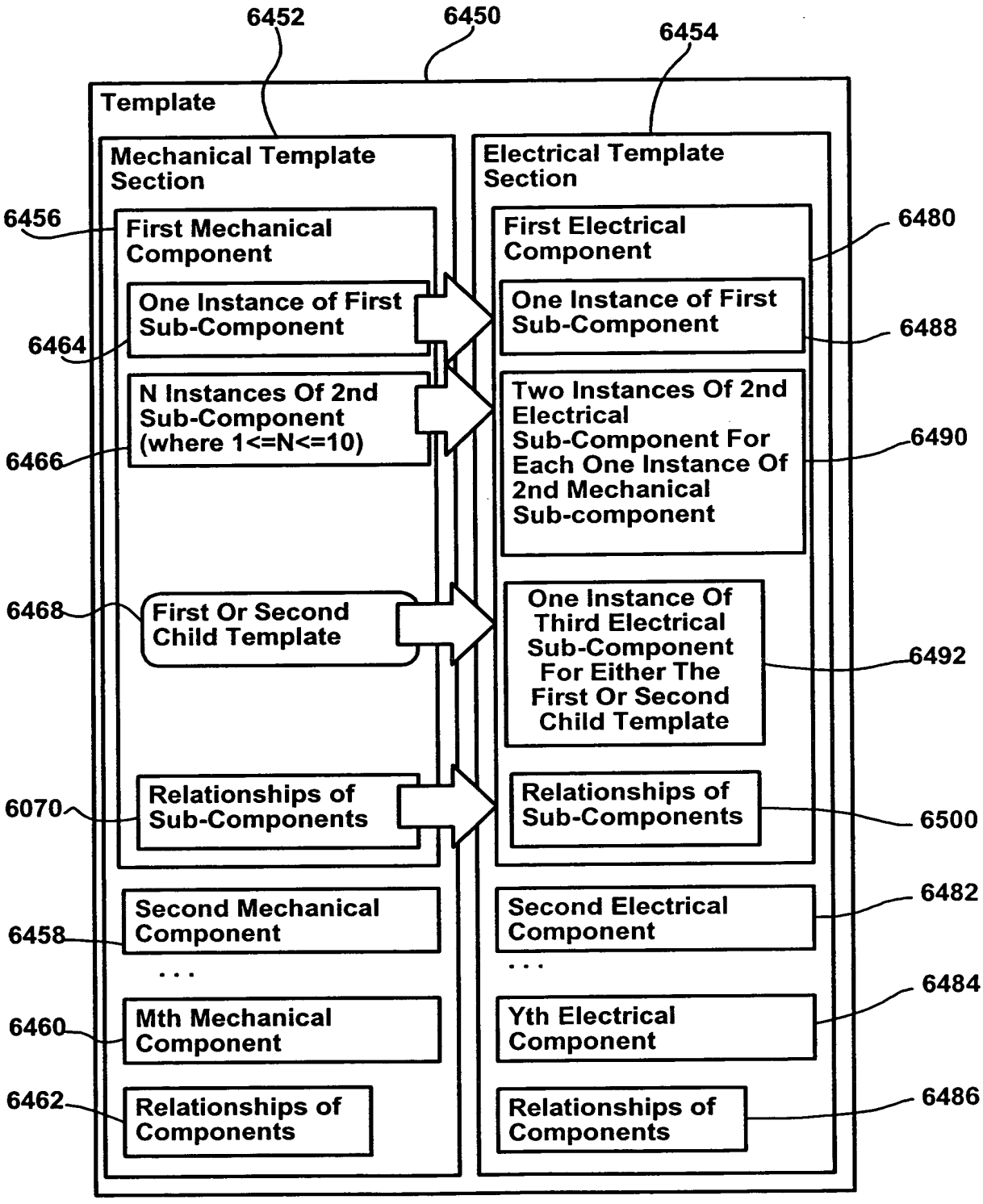

6452
6450
6454
Template
Mechanical Template Section
Electrical Template Section
6456
First Mechanical Component
First Electrical Component
6480
One Instance of First Sub-Component
One Instance of First Sub-Component
6488
6464
N Instances Of 2nd Sub-Component (where 1<=N<=10)
Two Instances Of 2nd Electrical Sub-Component For Each One Instance Of 2nd Mechanical Sub-component
6490
6466
6468
First Or Second Child Template
One Instance Of Third Electrical Sub-Component For Either The First Or Second Child Template
6492
6070
Relationships of Sub-Components
Relationships of Sub-Components
6500
Second Mechanical Component
Second Electrical Component
6482
6458
Mth Mechanical Component
Yth Electrical Component
6484
6460
6462
Relationships of Components
Relationships of Components
6486

Fig. 132